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VIEWS, NEWS AND INTERVIEWS.

After the edict went forth that certain departments of the General Electric Company would hereafter be located at Schenectady, N. Y., an officer of the General Electric Company went to one of the heads of departments and said:

"Mr. Blank, we're going to Schenectady, you know. How much office room do you think you'll need?"

"Sure we're going up there?"

"Yes."

"Well, as long as we're going to be buried, I guess two by six is all the room I'll need."

Three men were arraigned in the Harlem Police Court, New York, last week, on a charge of having tapped a Western Union wire at 125th street and Eighth avenue, presumably for the purpose of beating the pool room operators. The joke of the affair was that the wire tapped was dead.

An electrical engineer, who is also the editor of a technical paper, tells me of an amusing, though, to him, costly experience, says a writer in London *Lightning*. An intending client called on him at his office, which is lighted by electricity, to arrange for the lighting of his own house. While they were talking the light in the room first flickered and then failed altogether. It was quite in vain that my friend disclaimed all responsibility for the failure, and pointed out to his client that his supply would be from a different company altogether. "If you can't keep the light going in your own office, I am not going to trust you to light my house," said his visitor. "Really, I have nothing to do with it here," replied the unhappy editor; "it is all the fault of the ——— company." "If you were any use as an electrical engineer you would store the company's electricity, or manage it somehow," was the reply. And in the long run, finding it was impossible to make his client understand, my friend had to be content to lose the job.

Walter H. Campbell, an alleged promoter, has decamped from Chicago with between $100,000 and $150,000, which he swindled people out of by claiming to form a company to work the patents of a Boston electrical forging company in Illinois. He secured $45,000 in cash from one man.

Hanging in a newspaper office in Hawaii is the chart of the survey made by the "Thetis" of the bottom of the Pacific ocean, with reference to laying a cable from Hawaii to the California coast. The ocean bed is very level—"so level," as one of the officers remarked, "that, if on dry land, a railroad train could run over a stretch of 500 miles of the bed at a speed of 60 miles an hour without the grade being altered anywhere."

A dispatch from Portland, Ore., says that a break in the insulation of the wires connected with the incandescent lights at the bottom of the swimming bath, at the Multnomah Athletic Club, created a wild commotion for a time. Several persons who plunged into the bath were severely shocked by the escaping currents of electricity and were unable to help themselves. The friends who rushed to their assistance were smartly shocked by touching the brass railing around the tank, and in the general commotion the bathers came nearly being drowned before they were pulled out. The wire connected with the lamps was finally cut and an end put to the trouble.

William Hampden Johnstone, he who undertook to formulate the subway system for electric wires in New York, but failed to do it, dropped in at the Waldorf yesterday. He looked as well as ever and had a wad, but took an afternoon train for Philadelphia to spend it. In the past 12 years—I didn't know him before that—he has been rich and poor in alternation seven or eight times. —*New York Morning Journal.*

An Electric Funeral.

Here is a description of a funeral in which the electric funeral car on the San Francisco and San Mateo Electric Railway was used:

The six pall bearers who accompanied the hearse quickly lifted up the coffin containing the body and slid it gently in through the open door. Then, with uncovered heads, they climbed in after it and closed the funeral draped door. The conductor rang the bell twice, the motorman clanged his gong with a noise that seemed somehow strangely out of place, turned on the electric current, and the dead man started on his last journey. Meanwhile, the mourners, members of the Pythian order, had arrived in carriages following the hearse. They boarded an ordinary electric car that was also in waiting, and a moment later the crowd drew back at the sound of the gong and the car followed No. 32 and its lifeless burden. It was hard to realize that the two cars rolling rapidly along the street lined with gaping spectators were a funeral train—the shouts of the children along the route, the sharp clanging of the gongs, and particularly the speed of the cars, were so totally dissimilar to the accustomed solemnity of such parades. People hurried to the windows of the house along the line and few even waved handkerchiefs, as if it were a gala occasion of some sort.

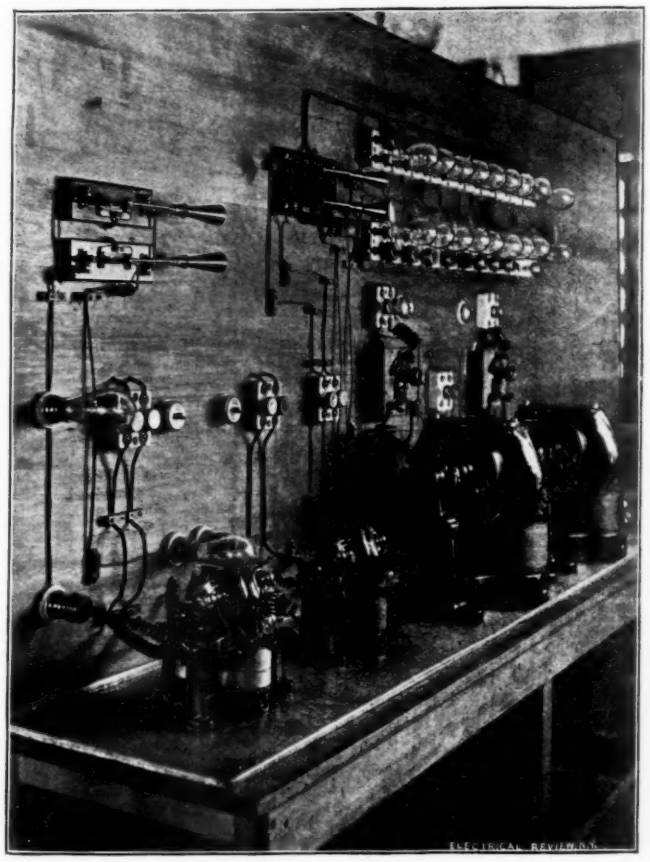


FIG. 1.—PORTION OF THE CURRENT GENERATING PLANT IN A MODERN TELEPHONE EXCHANGE.

A TELEPHONE EXCHANGE HOUSE-WARMING.

THE BROAD STREET EXCHANGE OPENED AND THE PATRONS INVITED TO SEE ITS WORKINGS.

President Charles F. Cutler and General Manager U. N. Bethell, of the Metropolitan Telephone and Telegraph Company, attended by their staff, threw open the doors of their new telephone exchange, at 95 Broad street, New York city, last week. The patrons of the exchange and members of the press of the city were invited to visit it and turned out in numbers. The multiplicity of details of the vast telephone system of this city, as exemplified in this great telephone exchange, proved to be highly interesting to every one. It was the common remark among the many distinguished financiers of Wall and Broad streets, who were present, that they never realized the amount of machinery and effort the ringing of their office telephone bell set in motion.

Among the distinguished newspaper men who visited this exchange was Mr. Murat Halstead, editor of the *Standard-Union*, of Brooklyn, who held a perfectly satisfactory conversation with his son in Cincinnati, the managing editor of the *Commercial Gazette*, of that city.

The telephone people are to be felicitated over the idea of acquainting their patrons with the great telephone system of this city. Familiarity with details in this case does not breed contempt, but rather wins respect from every person of intelligence.

One of the most striking features of electrical development, as presented for the first time in this central office, is the extent to which the latest advances of electric light and power practice have been adapted by the telephone engineer to his peculiar wants. Instead of the old time battery room, with its rows and rows of not always well kept batteries, one here sees an array of machines that puts to the test his knowledge of electrical engineering "up to date." Here the dynamotor or rotary transformer may be seen at its best.

In Fig. 1 is shown a view of part of the power plant which consists of Crocker-Wheeler machines. The current is taken at 220 volts from the Edison street mains and converted by various transformers into 90 volt alternating for signalling subscribers;

into 6 volts direct for charging storage batteries; and into 30 volts direct for relay testing. Various other dimensions of current are obtained from the electric light mains and employed in a diversity of ways.

The storage batteries are used for operating the central office transmitter and the locking mechanism of the line drops. The switch board itself is of the "bridging" type and has no normal contacts. The excellence of the arrangement of the apparatus and the high character of the workmanship throughout has never before been equalled.

The Broad street exchange, which serves the district bounded by Wall street and Broadway from Wall street to the Battery, is the eighth central office of the New York telephone system. It is one of the four larger offices which have been placed in fire-proof buildings specially constructed to contain telephone centers. In every feature it represents the most modern development of telephone engineering, and so rapid has this development been, that in no single item of its equipment does the Broad street exchange resemble the equipment of a telephone exchange of four years ago. The Broad street exchange at present supplies telephone service to some 1,100 subscribers, all of whom have been transferred from the Cortlandt street office, which, until lately, served nearly 5,000 subscribers and was overcrowded. The ultimate capacity of the Broad street office is for 3,000 subscribers. It contains the latest type of metallic circuit multiple switch board, a notable feature of which are the ingenious self-restoring indicators. These indicators return to their normal position automatically, thus relieving the operator of two manual operations, and, consequently, quickening the service.

During the past year or two improved methods of construction of lines and the placing of underground cables have been pushed with great vigor, resulting in the removal of old overhead wires and their substitution by copper metallic circuits throughout. In the Broad street district few old style lines now exist, and not a single wire enters the exchange overhead. All the subscribers' lines are brought into the building through the basement in lead covered cables, each containing 50 metallic circuit conductors.

The telephone system of New York city consists at present of eight exchanges, equipped with metallic circuit multiple switch boards, having a total accommodation for 15,000 subscribers, upwards of 9,600 subscribers' stations, 800 private line stations and 30,000 miles of underground wire. The entire system is constructed on a basis of exclusive metallic circuit working. About 60 per cent. of the subscribers now have metallic circuit lines and equipment, and the conversion from the old style grounded lines to metallic circuits is progressing with great rapidity.

With a metallic circuit line and office equipment, a New York telephone subscriber can talk from his own desk to any one of upwards of 100,000 telephone subscribers in other cities, some of them over 1,000 miles distant. This extraordinary development of telephony in America is in striking contrast with the state of the art in Europe, where subscribers can get only local service from their own instruments, and, to use a long distance line, must go to the terminus of the line, making an appointment with the distant correspondent first by telegraph. There are between 80,000 and 90,000 conversations by telephone each day in New York city, and the average use of the telephone by each subscriber is 16 times daily. Many busy subscribers use their telephones from 100 to 200 times daily.

For the entire system there are over 400 lady operators. About 250 are on duty at the switch boards at the same time. The average number of connections made daily by each operator is a trifle under 400.

At every exchange comfortable sitting rooms, provided with lockers, tea and coffee urns, etc., are established for the use of the operators when not on duty at the switch board. In Fig. 2 is shown an exact reproduction of a telephone lunch scene.

A peculiar feature of the daily business of a telephone exchange is its enormous fluctuation. Although the service is permanent, the greater proportion of the 24 hours' work is compressed into two periods of about two hours each. In order to cope with these high pressure periods without delay in the service, the entire plant and personnel of the system have to be organized as if the whole of the day's work were on the same plane. Besides the operators, there is at each exchange a skilled force of electric wiremen constantly engaged in making connections and keeping all parts of the plant in efficient working order.

The working force needed to maintain the telephone service consists of about 1,000 persons, an average of one employé to every nine subscribers. The technical work is carried on by departments, each having a large force of men under a responsible head. Some idea of the amount of construction work done can be gained from the fact that during 1893 more than 3,000 lines were built and an equal number of stations equipped and more than 2,000 disconnected and removed.

The opening of the Broad street office not only signalizes the highest results of telephone engineering, but when considered in its larger bearing must be regarded as the triumph of a broad-gauge policy, of unusual executive ability and of complete organization. These qualities, it pleases us to say, are characteristic of the Metropolitan Telephone and Telegraph Company, which controls the telephonic destiny of the metropolis.

Slot Telephones in Chicago.

The Chicago Telephone Company has placed a number of slot telephones in public places. There are five slots for corresponding coins, from a nickel to a half dollar, and each coin signals its fall by ringing a bell of different tone.

A. S. Hibbard, general manager of the Chicago Telephone Company, in speaking of the instrument, said:

"We are making a trial of these instruments, and if their introduction is at all satisfactory, we will put them in every public place in Chicago. They are designed expressly to accommodate the outside public, that part of which is not on our subscription list. There are more than 10,000 telephones in use in this city, and the outside use of these is enormous. It is not entirely the fault of the subscribers. They don't always feel that they can refuse the use of the instrument to a customer or a friend, and I think a general introduction of the automatic instruments will eventually head off deadbeadism, and at the same time give the company a revenue from transient business. We employ special operators for them in the main office.

Averse to Underground Wires.

An organization in Boston, known as the Inside Electric Workers' Union, has arrayed itself in opposition to the burial of overhead wires and gives with charming *naïveté* the following unique reasons for its position:

To bury the wires would be to throw hundreds of linemen out of their jobs: These men would probably go into inside work, and that would not benefit the members of the union of the present inside men. Then again, linemen receive from $2.50 to $2.75 per day; and if all wires were piped below the surface, the work of handling would be done by pipemen who received but $1.75. Further than that, the pipemen have work but a small part of the year.

Electric Lighting in Germany.

The German Postal Department is now introducing electric lighting in 26 of the postal cars running between Berlin and Frankfort, Berlin and Cologne and between Berlin and Breslau. The town of Mannheim is to have a central electric lighting station. Messrs. Siemens and Halske, of Berlin, have been awarded the contract for a central electric lighting station at Leipzig.

THE STATION REPAIRER.

A PEEP INTO THE HOSPITAL WHERE THE ILLS OF MACHINERY ARE CURED.

THE VALUE OF A GOOD SYSTEM—ELECTRIC DRILLS OF GREAT SERVICE—EXPENSE OF SECONDARY CONSIDERATION — CAREFUL AND SKILLFUL WORK DEMANDED—A STOREHOUSE FULL OF DUPLICATE MACHINERY.

Time, that great element of decay and destruction, is a great factor in the economical construction of all kinds of machinery. The continual or intermittent use of a piece of apparatus must be taken into consideration, and the construction calculated accordingly. The wear and tear of a machine, of course, goes towards making its cost of maintenance more expensive, and the men who are required to run the repair shop correspondingly increase the pay roll of the company. In the case of trolley and other electrically operated car lines, special shops are required, and a completely appointed work room, systematically maintained, forms a part of the power house plant.

The repair shops are of two kinds, one for the requirements of the power house plant alone, and one for the cars. These latter are supplied with what are known as pits over which the cars are run and in which the workmen can conveniently work, with the car on tracks above them. In the power house repair shops the work is entirely different. Here the engines, dynamos, pumps, piping, etc., need attention; in short, it is a machine shop in itself, supplied with heavy lathes, planers and drill presses. In order to accommodate the large parts of the machinery, correspondingly large tools must be used, and almost any simple, fair-sized engine could be constructed within the walls of some of the shops now installed for the use of the large systems in and around this city and Brooklyn.

In order to see how things were arranged in a well appointed shop, a trip to one of the largest, that owned by the Brooklyn City Railroad at their Kent avenue power house, enabled me to see a well-organized and systematized repair workshop.

Mr. Anderson, who has charge of this department, has spent a great deal of his time in perfecting the details, and his constant supervision has produced a system which will enable any parts in the huge plant to be repaired at a moment's notice.

The check system is used, and no workman can obtain any supplies without a written order or ticket, which is immediately placed on file and stands against him until the tool is returned or the material accounted for. This enables a strict account to be kept of everything that comes in or goes out, thereby saving the odds and ends, which at the end of the year amount to considerable in value.

"How does your system work?" I inquired.

"Perfectly," he replied. "The shop is kept in the best of order, and owing to the fact that a duplicate of everything is kept on hand, workmen are not delayed in what they are doing. Everything runs smoothly. There is nothing to complain of. But not all of the repair work is done in the shop, for much of the apparatus is too bulky to move around, so it must be a case of Mahomet going to the mountain. The workmen must take their tools to the part of the machine. We find the portable electric drills of the greatest convenience. Our work would be most difficult were we not provided, as we are, with the latest devices in this line. In order to get into difficult, out of the way places we use a flexible arm, which enables us to drill any holes in joints or piping with the greatest ease. We have some very difficult cases, some tangles where the pipes are so snarled up that it looks as if they never could be got into position."

Mr. Anderson then showed me what seemed a remarkable piece of pipe fitting, which he assured me had been done inside of a week, which, had it not been for the recent improvements in tools he had at his command, it would have taken twice the time to install. "All of the pipe fitting," he said, "we get in the rough casting, the drilling and fitting we do ourselves."

Considering the fact that all of the moving of the heavy pieces of apparatus has been done with the aid of chain falls, the motive power being human, the progress that has been recently made may be considered remarkable.

"Why are the traveling cranes not provided with electric motors," I asked.

"I couldn't say," he replied; "after we get all our plant in and most of the heavy work done, then, I presume, they will be equipped with motors. Expense in connection with the building and maintenance of this power house is entirely a secondary matter. We get the best that can be procured."

"Even if the best is obtained," I asked, "are there not repairs being continually required?"

"Decidedly; and it is for that purpose that we keep the repair shop, and we have work enough for a corps of men to be continually employed."

"What happens if some large piece of machinery breaks?"

Taking me into a well equipped storeroom, he pointed to a number of parts of engines and dynamos, parts which are most liable to be broken, bent or rendered unfit for use. "In case a cylinder head becomes cracked or an accident occurs which necessitates extended repairs, we shut down the defective engines, start the others, and our duplicate plant is then run until the necessary repairs are made. The duration of the time for repairs, of course, widely varies, but seldom does an accident happen which would delay the operation of a plant for more than a week. Our shops have nothing to do with line repairs; all that we do here is to attend strictly to the repairs which are necessary in the station itself."

"It would seem to me," I suggested, "that after the plant is entirely installed, you would have no further use for the huge traveling cranes."

"Very seldom does a day pass that we do not use the cranes," was the reply.

"Are there not special tools which are required in the line work which could be made here?"

"We can make anything in our shop, and we employ only workmen who are proficient in their special line. Parts of the motors we can repair here if necessary, but the work is simple, and nothing more than is daily done in an ordinary machine shop is done here. It is in the line repairing that interesting details can be obtained; on that work a man must think quickly, and he must continually have his wits about him. Here the work is of a more deliberate nature, but what is done must be done well and made to last."

JULIAN A. MOSES.

An Alleged Conspiracy at Indianapolis.

The officials of the street railway system at Indianapolis, Ind., said last Friday that they had discovered a plot on the part of discharged employés to ground the wires on a number of the chief lines, and then finally to blow up the power houses of the company by the use of dynamite. It is said that one of the conspirators has turned informant, and arrests may follow. The movements of many of the discharged men are being closely watched.

Governor Flower Recommends Electric Propulsion on the Erie Canal.

In his annual message to the New York legislature, delivered on January 2, Governor Roswell P. Flower recommends electric propulsion on the Erie Canal in the following words:

It has seemed to me, however, that the most practical plan for immediately increasing the tonnage of the Erie canal is that which would supply a speedier and more economical motive power. Mules and horses now propel canal boats at a rate of about two miles an hour, while steam sends them along at the rate of about three miles. The banks of the canal will stand a speed of about four miles an hour. It seemed to me, after personal observation of present methods, that electricity might be applied as a motive power with a considerable saving in cost and a considerable increase in speed. Experiments in this direction were authorized by the last legislature, upon my recommendation, and seem to have demonstrated clearly the feasibility of using electricity as a motive power on the canals. The only question still to be determined is that of cost, and the estimates are quite favorable to a considerable reduction from the cost of propulsion by steam. Just how much of a reduction could be obtained it is, of course, impossible to say definitely, but very conservative estimates make the saving in cost of transportation at least 25 per cent., and the increase in speed at least 30 per cent. The advantage of electricity over mule or horse-power would be much greater. If these results could be attained, the benefit to the canal would be immediately greater than the benefit which would flow from all the proposed enlargements, and need not cost the State a penny. Boatmen could make many more trips in a season, fewer employés would be needed on each boat, no money would be required for horses and mules, the large space occupied by steam boiler and engine would be saved for freight, and danger from fire or explosion would be avoided. At the same time the increased tonnage and business of the canals would provide more employment and more remunerative occupation for boatmen. Other advantages readily suggest themselves. It should be clearly understood, moreover, that the adoption of electricity as a motive power does not mean the abandonment of horse, mule or steam power, if boat owners prefer to have their boats propelled by these powers. The idea is that whether the State furnishes the electric power from its own plant, or whether individuals or corporations furnish it under contract, there will be no compulsion to use it, but the endeavor will be to supply it at such a low cost to boatmen that they will find it advantageous to apply it to their boats in the interest of economy.

This plan need not interfere, either, with any proper enlargement or deepening of the canal. Indeed, if the plan is found to operate satisfactorily, the next logical and necessary step would probably be to so improve the canal as to enable the use of larger boats. But for the present I am quite convinced that the proper course is to give electric propulsion a fair trial, and, if it accomplishes what is claimed for it, a new era of activity and prosperity should begin for our canals. Grain has been carried during the last season from Chicago to Buffalo for as low as one cent a bushel; boatmen can carry it profitably at two cents a bushel. If by cheaper and quicker propulsion the cost from Buffalo to New York by way of the Erie Canal can be reduced to three cents a bushel, as is reasonable to suppose, there is no other carrying route that can successfully compete with it, and a continuance of New York's supremacy is assured. Moreover, the harnessing of the tremendous water torrent of Niagara to the wheels of industry will furnish the cities of Buffalo and Rochester and all Western New York with the cheapest power for manufacturing in the United States. We may look forward to the time when the great flour mills of the world will be located there, for the cheapness of power would more than compensate for the cost of transportation of grain from the fields of the Northwest. So with other manufactories. Then, more than ever, will be needed cheap transportation through the State. To-day the Erie canal does not carry one-half its capacity. Reduce the cost of transportation and increase the speed and the tonnage will increase, and when the tonnage increases then will be the proper time to seriously consider expensive schemes of enlargement.

The essential point in arranging for the application of electric propulsion on the canals is that the power should be furnished at the lowest possible cost, and any construction of State works for this purpose or any contract with individuals or corporations for supplying power to the boatmen should be hedged about with abundant safeguards for the protection of the public interests.

Stephen B. Elkins and Robert P. Porter, ex-superintendent of the United States Census, have been elected to the board of directors of the Harrison International Telephone Company, of Chicago.

PERSONAL.

Prof. George Forbes arrived in New York from England last Saturday.

Mr. Samuel Insull, president of the Chicago Edison Company, has sailed for Europe.

Mr. Alexander Siemens has been elected president of the Institution of Electrical Engineers.

Mr. George H. Babcock, of the Babcock & Wilcox Company, who died at Plainfield, N. J., on December 16, 1893, left a fortune estimated at $5,000,000.

Superintendent Campbell, of the Postal Telegraph and Cable Company, Pittsburgh, was a New York visitor last week, and paid a pleasant visit to the ELECTRICAL REVIEW.

Mr. S. C. Fiske, superintendent of the Buffalo and Williamsville Electric Road, was sandbagged within a few rods of the Williamsville power house in Buffalo, N. Y., one night last week, and robbed of $160 in money, his watch and other valuables. His assailants escaped.

Prof. J. P. Barrett, city electrician of Chicago and chief of the World's Fair Department of Electricity, accompanied by his son, was a welcome visitor at the ELECTRICAL REVIEW office Monday of this week. Prof. Barrett is enjoying excellent health and has survived the worry incident to his World's Fair work in splendid shape.

FIG. 2.—SCENE IN THE LUNCH ROOM OF A MODERN TELEPHONE EXCHANGE.

Mr. William T. Dulany, Jr., of 280 Broadway, has made application to the Brooklyn Council for permission to excavate a mile of streets in which to lay his underground electric railway system. The request has been referred to a committee. Mr. Dulany has not as yet made known the nature of his system, but is said to have made application for patents to cover it.

Mr. Walter C. McKinlock, secretary of the Metropolitan Electric Company, Chicago, has just returned from a successful business trip and reports the outlook for this new company as very promising. The Metropolitan Electric Company are handling the Blair adjustable lamp hanger, which enables the lamp to be raised or lowered automatically, and it is becoming very popular in electric lighting circles.

Capt. Edmund L. Zalinski, of the Fifth Artillery, having been recommended for retirement by the Army Retiring Board at New York, has had granted him indefinite sick leave until a vacancy occurs on the limited retired list. Capt. Zalinski is the inventor of the pneumatic dynamite gun, and is well known in electrical circles. He suffered a stroke of paralysis several years ago, and this interfered for a while with active duty. When the Brazilian cruiser "Nictheroy" was being fitted out at New York, Capt. Zalinski received an offer from the American agents of President Peixoto, to work the dynamite gun on board the vessel, which he was not allowed to accept. His leave does not include permission to go now.

GENERAL ELECTRIC MOVES TO SCHENECTADY, N. Y.

THE BROAD STREET OFFICES WILL BE DESERTED—STATEMENT FROM PRESIDENT COFFIN—VICE-PRESIDENT HERRICK HANDS IN HIS RESIGNATION—DISSATISFACTION AT THE CHANGE.

As intimated in the ELECTRICAL REVIEW for December 27, 1893, the order has finally gone forth that all the departments of the General Electric Company, except those of the eastern district, a transfer department, a legal department and quarters for the executive committee, will be transferred to the works at Schenectady, the cavalcade having orders to begin moving Friday of this week. Business will be done from Schenectady on and after January 15. It is said on very good authority that the Thomson-Houston works, at Lynn, will be practically closed, leaving but 300 or 400 men to turn out certain small work. The purchasing department, of which Mr. Webster is the head, will also be moved from Boston to Schenectady.

The company now occupies three entire floors of the Edison Building, at 44 Broad street, New York, and in addition has offices on other floors. It is said that the move will effect a saving of between $150,000 and $200,000 in rent and taxes alone. After the removals are completed, the departments left behind will find ample accommodations on one floor. Vice-President Griffin and four department managers will have their headquarters at Schenectady. The New York city department will be in charge of Mr. Hughes.

President Coffin was asked for a statement regarding these proposed changes from New York to Schenectady. He gave out the following typewritten statement:

"In order to fully centralize the manufacturing, engineering and selling organization of the General Electric Company, the general offices of that company have been established at Schenectady. The offices of the different department managers and the technical force are also located there. This will result in a much more compact organization and enable the Company to add largely to the economies already instituted."

Signs of confusion are apparent in the offices at 44 Broad street; desks are being packed in excelsior and burlap marked "General Electric Company, Schenectady, N. Y.," and business is being carried on in a hurly-burly manner pending the change.

The office building at Schenectady, formerly occupied by the Edison General Electric Company, will be used as offices for the General Electric Company. There is considerable dissatisfaction among the employés of the company over the change, and many of them are in a quiet way hunting around for something else to do, preferring to make a change even in these hard times rather than go to Schenectady.

President C. A. Coffin recently wrote a letter to Managing Director Eugene Griffin in which he said there would never be a better opportunity to practice economies and reduce forces than at present, and requested him to notify the various department managers that they must reduce their forces to the lowest point before the move to Schenectady was made.

Of course, there are many rumors floating about and much gossip is indulged in at 44 Broad street over the sudden change. One of the current stories last week was that when the matter of moving to Schenectady was first broached it was the idea of Mr. Crosby and Mr. Greene to stay in New York and send their departments up to Schenectady. President Coffin heard of it and informed these two gentlemen that they were to go to Schenectady, live there and make it absolutely their headquarters.

On Friday last Vice-President J. H. Herrick tendered his resignation from his office and from the board of directors rather than go to Schenectady. A well-known Wall street broker, in speaking of this change, said that he never knew a better business man than Mr. Herrick, nor one who had greater facilities for borrowing money, and if it had not been for Mr. Herrick last Summer he did not know what the General Electric Company would have done, as Mr. Herrick furnished them with the larger part of the money that was borrowed. Continuing, the broker said: "I believe that before February 1 the entire floating debt of the General Electric Company will have been wiped out, and I think the stock is intrinsically worth its market price to-day; that is, from 30 to 34. I think the assets of the company, including the good will of an established business, will show that the stock is worth from 50 to 52. Now that the company is free from its floating debt, its whole success or failure depends upon its management. In my opinion, the move is a very bad step. I do not see how such a company as the General Electric can afford to be without official headquarters in New York. On the other hand, I believe that they can manufacture at Schenectady as cheaply as anywhere in the United States, and I think the closing of the factory at Lynn is a wise move, because it is much more economical to run one factory on full time than two factories on half time."

Mr. Thomas A. Edison was in New York on Friday of last week, and attended a meeting of the board of directors of the General Electric Company, the first one he has been present at for many weeks.

It is understood in New York that Prof. Elihu Thomson will be expected to move to Schenectady. A friend of his states that Mr. Thomson does not regard the proposed change with favor, as he has just completed a $100,000 residence at Lynn, Mass.

Columbia Lamps Reduced in Price.

The Columbia Incandescent Lamp Company, St. Louis, announces that on and after January 10, 1894, the prices of Columbia lamps will be as follows: 10, 16 and 20 candle-power, 32½ cents each, net; 25 candle-power, 35 cents; 32 candle-power, 50 cents; 50 candle-power, 75 cents; special railway and anchored filament, 37½ cents. These prices are for barrel lots and over. For less quantities than barrel lots 2½ cents each will be added.

The same high grade of the Columbia lamp will be maintained. The company is able to make this reduction by reason of the magnificent support which it has received from users of incandescent lamps throughout the United States during the past year. This has enabled the Columbia Company to largely increase its manufacturing facilities and add other machinery, which has reduced the cost of production.

New Year's Calls by Telephone.

That enterprising newspaper, the St. Louis *Globe Democrat*, this year indulged in New Year's calling up to date—that is, they called up every telephone subscriber in St. Louis, and wished all those who answered a "Happy and prosperous New Year."

There are 3,735 telephone subscribers in St. Louis, and the *Globe Democrat* has three telephones in its business office. For this occasion this number was re-inforced by seven instruments, which were placed on the fourth floor of the building. Superintendent Durant, of the telephone company, personally superintended the novelty in New Year's calling, which was at the same time a practical test of the efficiency of the telephone service. That it might be the more satisfactory in the latter sense, no special provision was made for the reception and transmission of messages at the central office. The regular list of telephone subscribers was divided into 10 portions, in alphabetical order just as printed, and a portion given to each of 10 operators. The calls were made in accordance with the prescribed rules of the company, which are printed, framed and hung up at the side of every instrument in the city. Half a minute was allowed each station called for to respond before the number was checked off as not answering, and the next number on the list was then taken up. The calls were commenced at 8:30 A. M., and the last of the greetings had been delivered at 11:55.

The best results were achieved by operator McDonough, of the telephone corps. He is an expert at the 'phone. He called up 514 stations in 3 hours and 27 minutes, secured 260 answers, found 14 busy, 5 out of order and 235 not in use for the day. The whole time occupied in the transmission of the messages was 33 hours and 8 minutes; the average time of each operator was 3 hours and 19 minutes, and the average rate was 113 calls per operator per hour, a little the fastest thing in New Year's calling on record.

A New Fuel Compound.

The Northwestern Land and Coal Company was incorporated at Portland, Me., in 1888, to manufacture and sell a patented fuel compound known as "394."

It was prominently brought before the mining convention of the State of Wyoming, held at Cheyenne in 1891, and endorsed by that body. Up to the present time the field of operations has been largely confined to the West. Now that the matter of economy in fuel has become such an important factor in the profitable operation of electric light and power stations, the company propose to introduce it thoroughly in that field.

The main office is located in the Globe building, Boston, Mass., and the officers are Wm. N. Titus, of Boston, president; Stephen C. Perry, of Portland, clerk; Andrew H. Paton, of Danvers, Mass., treasurer. The compound is fully covered by United States patents. "394" is a chemical compound manufactured in both dry and liquid form, and when used in connection with any ordinary coal is claimed to have caused economy of fuel and increased boiler capacity. It is stated that it has received the endorsement of electric lighting and power plants, water companies and manufacturing establishments throughout the country, and has been tested and approved by Prof. R. C. Carpenter, of Cornell University. The company are now in a position to furnish it in any quantities.

Electric Lighting of Railway Cars in Austria.

Having regard to the numerous railroad accidents which have recently occurred all over the world, in which the damage has been increased by the explosion of gas used for lighting the cars, the Austrian State railway authorities have recently issued a circular to all the private railway companies in Austria, urging them to make experiments with the electric lighting of their cars with the view of replacing the present systems of lighting by oil and gas.

Lightning Digs Post Holes.

The man with the gingerbread was watching his neighbor laboriously digging post holes.

"They didn't dig 'em that way out in Colorado where I lived," said he.

The neighbor, who was a hired man, dropped his patent "digger," looked around to see if his employer was visible, found he was not, and took a seat on the ground, ready to listen. "How did you work it?" he asked. "By steam?"

"Steam?" said the man with the gingerbread. "Naw. Done it by lightning."

"Lightning?"

"Yas. You see, in the part of the State I was in they is no metals of any kind in the ground, and no trees. I've often watched the lightning cavortin' around in the heavens fer a hour at a time, jist achin' fer somethin' to strike at; but not bein' able to do so 'cause they wasn't nothin' it could take a start at—no attraction, you see. Well, one day I was a sweatin' away, just like you would be if the boss was around now, when a old feller, that lived there before I come, come along and says he'd show me a scheme to save all that work. You can bet I was willin', so he sends me to the house fer bag o' tenpenny nails, and he plants a nail in every place I had marked fer a hole. 'They is a storm comin', says he, 'and if I hain't mistakened she is a-goin' to do the job in one whirl.' I didn't say nothing, fer honest, I thought he wuz crazy, an I 'lowed I'd better humor him. After he got all the nails planted he dragged me away to a safe distance an' told me to watch her work. Pretty soon the storm come along, with more thunder and lightnin' in it than you will see here in a month o' Sundays. Directly it got over them nails. Then—bliff! blam! It went to pluggin' away at them there nails stuck in the ground, the most delighted lightnin' you ever see to get somethin' to shoot at. And ev'ry time she hit there was the neatest post hole dug out you ever see. I did haf to trim a few of 'em with a spade, but, as a gineral thing, they was as neat as a body would want to look at. Natur' is mighty useful if you know how to handle her."—*Indianapolis Journal.*

A Metal-Sheathed Bushing.

The Interior Conduit and Insulation Company, New York, have put upon the market a metal-sheathed bushing, which complies with the requirements of the Underwriters' rules and possesses many points of superiority. It is thoroughly water-proof and non-combustible, and has high insulating qualities. The armor gives special strength, durability and serviceability. This bushing requires a smaller hole in beams and joists than either porcelain or glass bushings, and this advantage should recommend it to architects.

The Underwriters' requirements on this subject are as follows:

Rule 18. Conductors.—Amend Section (*b*) to read as follows:

b. Must be protected when passing through floors; or through walls, partitions, timbers, etc., in places liable to be exposed to dampness, by water-proof, non-combustible, insulating tubes, such as glass or porcelain.

Must be protected when passing through walls, partitions, timbers, etc., in places not liable to be exposed to dampness by approved insulating bushings specially made for the purpose.

Rule 18. Conductors:

Section *b*. Second paragraph. Except for floors, and for places liable to be exposed to dampness, glass, porcelain, metal-sheathed interior conduit and vulca tube, when made especially for bushings, will be approved. The last two named will not be approved if cut from the usual lengths of tube made for conduit work, nor when made without a head or flange on one end.

OBITUARY.

Frank Squibb, dealer in electrical supplies at Hamilton, Ont., is dead.

Questions and Answers.

BY OUR "QUESTION EDITOR."

To the Editor of Electrical Review:

The newspapers tell of an accident in Brooklyn lately, and state that when the trolley pole slipped off the wire and struck the iron work of the elevated railroad the pole was melted. How could this be, if the trolley wire was the source of current? I am not familiar with electr'c railway construction only in a general way, but like the truth, and read the Electrical Review with great satisfaction.—Reader.

We have not investigated the facts, but allowing for a little reportorial vapor, the matter is simple enough. The current comes from the positive side of the generator out through the feeders, then into the trolley wire, then by the trolley pole through the motor to ground, or track circuit through which it returns to the generator. The elevated structure being all iron and grounded at every column may be considered under average weather conditions a direct ground. When the trolley slipped off the wire, the pole spring threw the pole up in such a way that it simply bridged the space between trolley wire and the iron work, touching both. Barring the loss of pressure from the generator to that point then, the full potential of 500 volts could have spent its energy in heating the trolley pole, the result being immediate and disastrous for the pole.

To the Editor of Electrical Review:

I have charge sometimes of a certain car. Ever since it was fitted up I notice the same thing, that occasionally when heavily loaded and on a grade one pair of wheels seem to fly around without doing any work, and it is always the same pair. Why is it? J. P. M.

Philadelphia, January 4.

If the car is evenly loaded and properly set on its truck, the two motors should do each its own share. Probably the motors are not matched in resistance, and belong to two matched pairs which got astray somehow. Or it may be that the controlling stand is not properly connected in the wiring. You should report the facts, and keep on reporting till the car is overhauled.

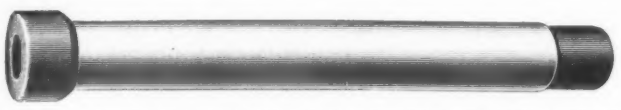
To the Editor of Electrical Review:

I ride home nearly every evening on a trolley car in Brooklyn. The electric lamps keep getting bright and dull in a most annoying fashion. I have a smattering of amateur knowledge in electricity, but I confess to being stumped. Can't the lights be made steady? Or is it a necessary evil with the trolley system? W. B.

By no means. It is chiefly a matter of copper. The fall of potential in a circuit is proportional to the current flowing, which in turn depends upon the resistance. At times, with the car heavily loaded, the motors running slowly have a low resistance, and the current may rise as high as 100 amperes. Now, as $E = C \times R$, you can see that the pressure would be absorbed in the feeders and trolley wire in a varying degree. The motors usually do not feel it so seriously, but when a heavy current is taken by the motors the feeders absorb more than a due proportion of the pressure, and less is left for the lamps. That is to say, the five 90 volt lamps in series may one moment have 450 volts, and the next moment but 400. Hence, a serious fluctuation of light, and this may occur on a car which is standing still or running steadily. The trouble then being caused by some other car on the same feeder section. There is usually but one cause, insufficiency of copper in the feeders, and the remedy is to add thereto.

The New York Electrical Society.

The next meeting of the New York Electrical Society will be held at Columbia College on Tuesday, January 16, at 8 P. M. Prof. M. I. Pupin will deliver a lecture on "Electrical Resonance," accompanied by experiments showing the properties and influence of self-induction and capacity on electric circuits.



Interior Conduit & Insulation Company's Metal Sheathed Bushing.

Electrical Workers University Extension Lectures.

The course of practical lectures on electrical subjects arranged by Electrical Workers' Union, No. 3, of New York, with the co-operation of Columbia College and Cooper Institute, is meeting with great favor. The aim is to bring these lectures within the means of the public by offering course tickets, 10 lectures, for $2, and single lectures for 25 cents. Course tickets may be had at Columbia College, Madison avenue and Forty-ninth street, or at the door of the large hall at Cooper Institute, on the evenings of the lectures, where single tickets may also be obtained.

Class work will be carried on in the following manner: After each lecture the instructor in charge will give a short talk on the subject of the previous lecture. This talk will embody answers to questions which have been submitted to him in writing. This work is in charge of W. H. Freedman, tutor in electrical engineering at Columbia College.

The following is a list of subjects and lecturers:

January 15—"Batteries; Primary and Secondary Batteries," C. O. Mailloux, consulting electrical engineer, No. 45 William street.

January 22—"Alternating Current Dynamos, Motors and Transformers," William Stanley, Jr., expert electrician, Pittsfield, Mass.

January 29—"Dynamos and Motors, Direct," Schuyler S. Wheeler, president Crocker-Wheeler Electric Company, No. 39 Cortlandt street.

February 5—"Electrical Measurements," A. E. Kennelly, electrician, Edison Laboratory, Orange, N. J.

February 12—"Electric Lighting," F. B. Crocker, professor of electrical engineering, Columbia College.

February 19—"Street Railways," T. C. Martin, editor *Electrical Engineer*, No. 203 Broadway.

February 26—"Power," Nikola Tesla, electrical engineer, No. 55 West Twenty-seventh street.

March 5—"Telegraph," William Mayer, Jr., electrical expert, No. 31 Nassau street.

March 12—"Telephone," J. J. Carty, electrician, Metropolitan Telephone and Telegraph, No. 18 Cortlandt street.

March 19—"Alarms," William Mayer, Jr., electrical expert, No. 31 Nassau street.

TELEPHONE CHAT.

The underground system at Omaha, Neb., was successfully put in operation at 4.15 P. M., December 14.

Telephonic connection between Colorado Springs and Cripple Creek, Col, the famous mining town, has been made.

The people of McDonald and Plymouth, Fla., are making arrangements to put up a telephone between the two places.

A lot of land containing about 4,000 square feet has been purchased at Worcester, Mass., by the New England Telegraph and Telephone Company, who will break ground in the Spring for a new building to be used as a local office building. It will be ready some time next July.

The following letter has been written to the mayors of cities and selectmen of towns in which the New England Telephone and Telegraph Company has central exchange offices:

"In case of two great fires which have recently occurred in different cities, this company has been enabled to offer assistance to the fire departments, by placing its system of toll lines at their disposal, for the purpose of summoning additional fire apparatus to their aid from other cities.

"It is now our purpose to arrange permanently for such emergencies in the future.

"Should a fire occur in your municipality of such magnitude as to render outside aid necessary, the chief, or other authorized person, may call, from any telephone, the person in charge of the central exchange office, stating that the fire department desires to summon aid.

"An expert operator will at once be detailed to attend to his wants, and to make every effort to obtain immediate communication.

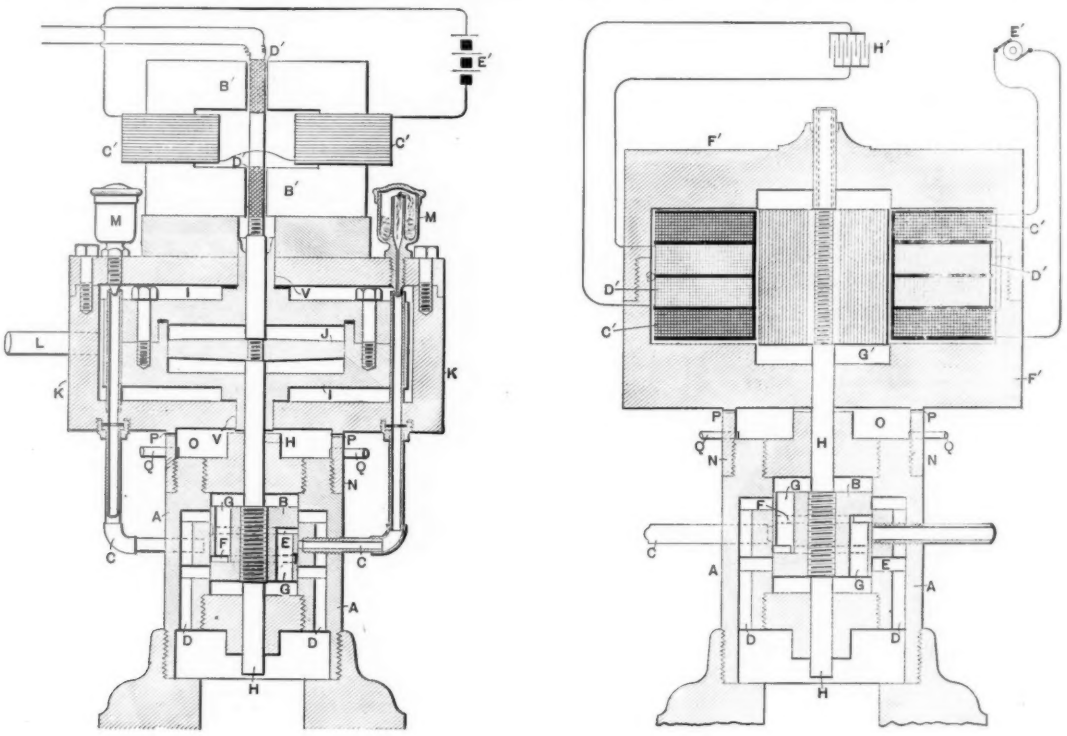
"All the lines of this company will be placed at his disposal for this purpose and to the exclusion of all other business. No charge will be made for this service."

Tesla's Electrical Oscillators.

Mr. Nikola Tesla, at the World's Fair Congress of Electricians, first drew attention to his method and apparatus for the continuous production of alternating currents of constant period, and in which he avoids all rotating parts by applying his oscillating engine directly to the movement of the generating coil in the magnetic field. The reason no engine heretofore has produced results of this nature is that it has been customary to connect with the reciprocating parts a heavy fly-wheel or some equivalent rotary system of relatively very great inertia, or in other cases where no rotary system was employed, as in certain reciprocating engines or tools, no regard has been paid to obtaining the conditions essential to the end which Mr. Tesla had in view. In applying the Tesla oscillator for the generation of currents of constant period, certain conditions are encountered which must be taken into consideration in order to satisfactorily secure the desired result.

When a conductor is moved in a magnetic field and a current caused to circulate therein, the electro-magnetic reaction between it and the field might disturb the mechanical oscillation to such an extent as to throw it out of isochronism. This, for instance, might occur when the electro magnetic reaction is very great in comparison to the power of the engine, and there is a retardation of the current so that the electro-magnetic reaction might have an effect similar to that which would result from a variation of the tension of the spring; but if the circuit of the generator be adjusted so that the phases of the electro-motive force and current coincide in time, that is to say, when the current is not retarded, then the generator driven by the engine acts merely as a fractional resistance and will not, as a rule, alter the period of the mechanical vibration, although it may its amplitude. This condition may be readily secured by properly proportioning the self-induction and capacity of the circuit including the generator. Mr. Tesla has, however, observed the further fact in connection with the use of such engines as a means for running a generator, that it is advantageous that the period of the engine and the natural period of electrical vibration of the generator should be the same, as in such case the best conditions for electrical resonance are established, and the possibility of disturbing the period of mechanical vibrations is reduced to a minimum.

Mr. Tesla has found that even if the theoretical conditions necessary for maintaining a constant period in the engine itself are not exactly maintained, still the engine and generator combined will vibrate at a constant period. For example, if instead of using in the engine an independent cylinder and plunger, as an air spring of practically constant rigidity, the piston may impinge upon air cushions at the ends of its own cylinder. Although the rigidity of such cushions or springs might be considerably affected and varied by the variations of pressure within the cylinder, still by combining with such an engine a generator which has a period of its own, approximately that of the engine, constant vibration may be maintained even through a considerable range of varying pressure, owing to the controlling action of the electro-magnetic system. Indeed, Mr. Tesla has even found that under certain conditions the influence of the electro-magnetic system may be made so great as to entirely control the period of the mechanical vibration within wide limits of varying pressure. This is likely to occur in those instances where the power of the engine, while fully capable of maintaining a vibration once started, is not sufficient to change its rate.



FIGS. 1 AND 2.—NIKOLA TESLA'S ELECTRICAL OSCILLATORS.

The accompanying illustration, Fig. 1, is a sectional view of an oscillator fulfilling the conditions laid down above. Referring to Fig. 1, A is the main cylinder in which works a piston B. Inlet ports C C pass through the sides of the cylinder opening at the middle and on opposite sides. Exhaust ports D D extend through the walls of the cylinder and are formed with branches that open into the interior of the cylinder on each side of the inlet ports and on opposite sides of the cylinder. The piston B has two circumferential grooves E F, which communicate through openings G in the piston with the cylinder on opposite sides of the piston respectively.

The particular construction of the cylinder, the piston and the ports controlling it may be greatly varied, and is not in itself material, except that in the special case under consideration it is desirable that all the ports, and more especially the exhaust ports, should be made very much larger than is usually the case, so that no force due to the action of the steam or compressed air will tend to retard or affect the return of the piston in either direction.

The piston B is secured to a piston rod H, which works in suitable stuffing boxes in the heads of cylinder A. This rod is prolonged on one side and extends through bearings V in a cylinder I, mounted in line with the first, and within which is a disk or plunger J carried by the rod H. The cylinder I is without parts of any kind and is airtight except as a small leakage may occur through the bearings V, which experience has shown need not be fitted with any very considerable accuracy.

The cylinder I is surrounded by a jacket K, which leaves an open space or chamber around it. The bearings V in the cylinder extend through the jacket to the outside air and the chamber between the cylinder and jacket is made steam or air-tight by a suitable packing. The main supply pipe L for steam or compressed air leads into this chamber, and the two pipes that lead to cylinder A run from this chamber, oil cups M being conveniently arranged to deliver oil into the pipes for lubricating the piston.

In the particular form of engine shown, the jacket K, which contains the cylinder I, is provided with a flange N, by which it is screwed to the end of the cylinder A. A small chamber O is thus formed which has air vents P in its sides and drip pipes Q leading out from it through which the oil which collects in it is carried off.

In the position of the parts shown, or when the piston is at the middle point of its stroke, the plunger J is at the center of the cylinder I, and the air on both sides of the same is at the normal pressure of the outside atmosphere. If a source of steam or compressed air be then connected to the inlet ports C C of the cylinder A, and a movement be imparted to the piston as by a sudden blow, the latter begins to reciprocate in the well-known way.

The movements of the piston compress and rarefy the air in the cylinder I at opposite ends, alternately. A forward stroke compresses the air ahead of the plunger J, which acts as a spring to return it; similarly, on the back stroke the air is compressed on the opposite side of the plunger J and tends to drive it forward.

The compressions of the air in the cylinder I and the consequent loss of energy due mainly to the imperfect elasticity of the air, give rise to a very considerable amount of heat. This heat is utilized by conducting the steam or compressed air to the engine cylinder through the chamber formed by the jacket surrounding the air spring cylinder, the heat thus taken up and used to raise the temperature of the steam or air acting upon the piston is availed of to increase the efficiency of the engine.

In any given engine of this kind the normal pressure will produce a stroke of determined length, and this will be increased or diminished according to the increase of pressure above, or the reduction of pressure below, the normal. In constructing the apparatus proper allowance is made for a variation in the length of stroke by giving to the confining cylinder I of the air spring properly determined dimensions. The greater the pressure upon the piston, the higher will be the degree of compression of the air spring, and the consequent counteracting force upon the plunger.

The rate or period of reciprocation of the piston, however, is mainly determined by the rigidity of the air spring and the inertia of the moving system, and any period of oscillation within very wide limits may be secured by properly portioning these factors, as by varying the dimensions of the air chamber, which is equivalent to varying the rigidity of the spring, or by adjusting the weight of the moving parts. These conditions are all readily determinable, and an engine constructed as above described maintains a perfectly uniform period through very wide limits of pressure.

The pressure of the air confined in the cylinder when the plunger I is in its central position will always be practically that of the surrounding atmosphere, for while the cylinder is so constructed as not to permit such sudden escape of air as to sensibly impair or modify the action of the air spring, there will still be a slow leakage of air into or out of it around the piston rod according to the pressure therein, so that the pressure of the air on opposite sides of the plunger will always tend to remain at that of the outside atmosphere. To the piston rod H is secured a coil D' which, by the movements of the piston, is oscillated in the magnetic field produced by two magnets B' B', which may be permanent magnets or energized by coils C' C' connected with a source of continuous current E'. The movement of the coil D' across the lines of force established by the magnets gives rise to alternating currents in the coil. These currents, if the period of mechanical oscillation be constant, will be of constant period. In the case under consideration it is assumed as a necessary condition that the inertia of the movable element of the generator and the electro-magnetic reaction which it exerts will not be of such a character as to materially disturb the action of the engine.

In Fig. 2 is shown an example of a combination in which the engine is not of itself capable of determining entirely the period of oscillation, but in which the generator contributes to this end. In this figure the engine is the same as that shown in Fig. 1. The exterior air spring is, however, omitted, and the air spaces at the ends of the cylinder A relied on for accomplishing the same purpose. As the pressure in these spaces is liable to variations from variations in the steam or gas used in impelling the piston, they might affect the period of oscillation, and the conditions are not as stable and certain as in the case of an engine constructed as in Fig. 1. But if the natural period of vibration of the elastic system be made to approximately accord with the average period of the engine, such tendencies to variation are very largely overcome and the engine will preserve its period even through a considerable range of variation of pressure.

The generator in this case is composed of a magnetic casing F', in which a laminated core G', secured to the piston rod H, is caused to vibrate. Surrounding the plunger are two exciting coils C' C', and one or more induced coils D' D'. The coils C' C' are connected with a generator of continuous currents E' and are wound to produce consequent poles in the core G'. Any movement of the latter will, therefore, shift the lines of force through coils D' D' and produce currents therein.

In the circuit of coils D' is shown a condenser H'. By the use of a proper condenser the self-induction of this circuit may be neutralized. Such a circuit will have a certain natural period of vibration, and, as this depends upon the capacity and self-induction, the period may be varied to approximately accord with the period of the engine. In case the power of the engine be comparatively small, as when the pressure is applied through a very small fraction of the total stroke, the electrical vibration will tend to control the period, and it is clear that if the character of such vibration be not very widely different from the average period of vibration of the engine under ordinary working conditions, that such control may be entirely adequate to produce the desired results.

Professor Rowland Sues The Cataract Construction Company.

Prof. Henry A. Rowland, of Johns Hopkins University, has brought suit in the United States Circuit Court against the Cataract Construction Company for $30,000 for his services as an electrical expert in planning a system to utilize the water power of Niagara for the generation of electricity. Professor Rowland says he devoted six months to the work, and then sent in his bill for $10,000. The company sent him a check for $3,500, which it considered sufficient. This angered Mr. Rowland, and he has brought suit for $30,000, declaring that he charged too little in the first instance.

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The *Electrical Age* has made another appearance after a period of innocuous desuetude extending over several months. We understand that its new mission is to take the place the *Electrical World* has left vacant. *Vivimus vivamus!*

Our advertisers may find it to their advantage to mail catalogues and any other printed matter they may issue to the trade to Dr. F. A. C. Perrine, professor of electrical engineering, Leland Stanford Junior University, Palo Alto, California.

Utica, N. Y., adopted electric cars some years ago; in fact it was one of the first cities to be equipped with electric traction. It is encouraging to learn that trolley accidents are few and far between in Utica, and we hope the good record will be maintained.

A letter endorsing the Pennock primary battery system as the "simplest known for electric lighting," is sent out from Boston with the name of Chas. R. Thomas, "with Edison Illuminating Company, Boston, Mass.," attached. We just rise to inquire if the said Edison Company agrees with its Mr. Thomas?

ELECTRIC STREET RAILWAYS IN NEW YORK CITY.

The capitalists who control the greater part of the railways in New York city have a serious problem ahead. They have constructed a cable railway on Broadway and have begun another further uptown, which may or may not be used as an extension of Broadway. The latter was a work of great engineering difficulty, which has been successfully completed, and the company deserves credit for that much. But it can scarcely be expected that all the other lines owned and controlled by the company will be cabled. Few of them are capable of being cabled, on account of the frequent curves, and the cost is almost prohibitory besides.

From the company's action about a year ago, it does not seem probable that it will renew any attempts to adopt the ordinary overhead trolley system, except possibly on lines under the elevated structures, where poles would not be required. This position of the company would appear to have been reiterated lately in its communication to the State Board of Railroad Commissioners.

Horse traction is doomed, sooner or later. Many reasons exist to justify this statement, not necessary here to repeat. Apart from those more immediately influencing the railway companies, public sentiment and a popular clamor for a more rapid method of propulsion will one day pass the sentence of mercy upon the poor animals.

Here then comes the problem: What method of propulsion is possible and practicable under the conditions of metropolitan streets and street traffic?

Steam dummies, apparently, were out of the question long ago. Compressed air motors have some advantages, but many disadvantages. They have been industriously exploited and carefully investigated by many competent authorities familiar with the practical requirements of street railway service in American cities, and yet have made no headway. Some air locomotives have been and are used in coal mines, not on account of any superior efficiency, or any attraction in cost of equipment, but because of the presence of explosive fire-damp and the necessity of fresh air, two conditions especially in favor of air as a motive power.

Gas engines have been tried, and we believe are yet under test, but we have not heard of any substantial adoption. Ammonia motors have, at intervals for years, under the guidance of different inventors, made their appearance, but seem to have made no practical headway. In all these non-electric methods, the principles of thermo-dynamics have been more or less intelligently applied and worked out, but when the tests have been made under the supervision of a hard-headed, practical and keen railway manager, his company has usually declined to attempt the introduction on a large scale. Latterly a combination of stored steam, or super-heated water, and highly compressed air has met with some little success abroad, but for our long lines this system is of doubtful value, owing to its limited capacity in car miles, coupled with the extra weight of the very heavy air-storage tanks and the engines.

Storage batteries and electric propulsion would be an ideal system, if theory always agreed with practice; but though now for over 10 years put through its paces under almost every conceivable shape and modification, the lead battery has practically made no headway for street car propulsion in this country, though some railway companies have given every facility and the accumulator companies have spent money with a liberal hand. We hear of recent tests, however, both with modified lead elements and elements of radically different metallic constitution, of which it may truthfully be said there is hope.

It, therefore, seems the problem must narrow down to either an improved storage battery system, or an underground electric system, of one of the two types proposed, *i. e.*, the slotted conduit with continuous trolley wire, or the underground insulated conductor with exposed contacts intermittently connected and disconnected automatically by the passage of the car. The last mentioned, owing to the absence of the conduit and slot structure, would seem to be the more promising in point of cost and maintenance, if the difficulties inherent to such a system can be surmounted in a simple and practical fashion. We look for much public benefit from the very sensible offer of the Metropolitan Traction Company, as it is bound to bring forth the best efforts of inventors of the underground system, in which we confess we have not a little hope of a successful outcome. It would give us all the undeniable benefits of the trolley system without any of its drawbacks. Poles would be absent, overhead trolley wires, guys, anchors and spans, would be dispensed with, and yet we could have the electric motor, rapid transit and cleaner streets. There are grave difficulties in the way, but to-day they are nothing to the mountains of prejudice and hills of difficulty which confronted the overhead trolley system a few short years ago, and progress is the watchword of the land.

The removal of the main offices and most of the departments of the General Electric Company from Boston, Lynn and New York to Schenectady, N. Y., appears to be an expression of the economical policy inaugurated by those directors who are giving their personal attention to the affairs of the company. In addition, we understand that a number of positions will be abolished, throwing out of office certain prominent officials. This movement is one of concentration, and the saving made will be of considerable magnitude. In the matter of rents and taxes for the New York offices alone it is estimated that between $150,000 and $200,000 can be saved.

Governor Flower's annual message to the New York legislature is a very business-like document. We reproduce elsewhere that portion of it in which he recommends electric propulsion on the Erie Canal. Governor Flower is thoroughly impressed with the importance of the canal system of the State, and believes that if by quicker and cheaper methods of propulsion grain could be brought from Buffalo to New York by the Erie Canal at a cost as low as three cents a bushel, no other method of transportation could compete with it.

It is a wonder that a number of accidents do not occur in Brooklyn, on Fulton street, near the bridge. Cars pass one point often at the rate of more than one a minute, and it is not an unusual sight to see a continuous block of cars moving slowly along with not more than fifteen feet of space between those furthest apart. An efficient transfer system which would permit of but one or two lines of cars passing down Fulton street might, to a great extent, obviate this difficulty.

CORRESPONDENCE.

OUR WESTERN LETTER.

The Wallace Electric Company have opened for business at 102 Michigan avenue, Chicago.

Test of Wires.—Prof. D. C. Jackson and Prof. M. O'Dea are making an elaborate test of insulated wires in Prof. Barrett's rooms in the city hall.

The Metropolitan Electric Company is to be congratulated on securing the services of Mr. J. J. Nate, as general manager of its combined interests.

Mr. Geo. W. Conover, for several years past the purchasing agent of the Ansonia Electric Company, has taken the agency of the Perkins electric switch, and opened offices at 1536 The Monadnock.

Mr. R. E. Richardson, of the Ansonia Electric Company, Chicago, will take unto himself a wife and begin the New Year as becometh a man. May rich blessings accompany the young couple through life.

The Central Relief Association have appointed Messrs. E. M. Barton, Wm. H. McKinlock and F. W. Cushing a committee to represent the electrical interests of the city of Chicago, in the work of relieving the distress of the unemployed.

A Disastrous Fire.—Electrical interests in Toledo suffered severely from fire on Wednesday, the Western Union Telegraph Company losing $25,000, the American District Telegraph Company $30,000, and the Toledo Electric Street Railway $7,500.

The Reliance Gauge Company, Cleveland, Ohio, commence the New Year with Reliance water columns in the leading electric railway and lighting plants. During the past year the additional orders from companies that had thoroughly tested the merits of these columns were sufficient to keep a large force of men constantly occupied.

Armour Institute.—A series of evening courses in engineering will be given at Armour Institute, each Tuesday and Thursday evening, under the direction of Dr. W. M. Stine. Mr. T. P. Gaylord, the instructor, organized the class in electricity on Friday evening, January 5. The tuition for evening instruction in electricity will be six dollars per term.

Taylor, Dee & Mack is the firm name of the successors to Taylor, Goodhue & Ames, 348 Dearborn Street, Chicago. It is a strong partnership arrangement, for Mr. Taylor has had nine years' experience in the supply business, Mr. Arthur Dee five years experience, while Mr. F. D. Mack has the practical training and the experience that is gained only in the personal supervision of installation work.

Helping the Unemployed.—Mr. W. H. McKinlock presided at a meeting of the electrical interests held at the Union League Club, Friday afternoon, in response to a call from the Central Relief Association, to consider the advisability of contributing one day's earnings or income to the relief of the unemployed and the destitute in Chicago. During the meeting it developed that the employés of the Western Electric Company had already voluntarily started a movement of this character; quite a sum was pledged, and it is understood that the company stands ready to duplicate whatever sum the employés may raise. Committees were appointed to call on the various branches of the electrical industry, and to report success at a meeting to be held this coming week. Mr. Mulford is looking after the telegraph companies and Mr. Gorton after the local lighting interests.

The World's Fair.—The buildings and grounds have been turned over to the South Park Commissioners, who are now in authority. The buildings are being emptied as rapidly as possible, but Collector Clark said yesterday that at the rate the work of removing foreign exhibits from Jackson Park has progressed during the past two months, it will require four months more to empty all the buildings. There are now in the buildings ready for shipment 29 356 cases of exhibits, and there have been shipped 17,791 cases. The record by buildings is as follows:

	Cases packed ready for shipment, January 2.	Cases shipped previous to January 2.
Midway	1,763	700
Fine Arts	2,248	3,000
Women's	800	260
Horticultural	946	312
Transportation	1 607	1,700
Manufactures	12,501	5,821
Mining	1,356	778
Electricity	1,085	600
Machinery	2,531	1,384
Agriculture	2,367	1,300
Forestry	2,143	1,942

Chicago, January 6. F. DE L.

Wall Street and the Electrical Stock Market.

The tendency of the Wall Street market during the past week has been upward. The movement does not reflect any improvement in the industrial situation. It simply means a change of base on the part of the professional element which almost entirely constitutes it. The decline of the previous week was brought about by sales of short stock which carried prices to a figure that forced some little liquidation. It reached a point hardly warranted by the situation. On this basis one or two prominent bull operators started a campaign against the bear element, forcing it to cover and in so doing put up prices. The detailed history of the week is a record of attacks on one stock or another for the purpose of weakening the general list and counter movements on the part of the bulls, in individual stocks, for the purpose of bringing about an advance. But little permanent ground has been gained by either side. From this it may be assumed that the market has been entirely professional. The only feature of strength outside of the speculative movement was the decision reached to take a vote on the Wilson bill, January 25. This is the first definite data which the country has had regarding the Wilson bill. Wall Street regarded it with decided favor.

All eyes are turned upon the industrial situation. So far as can be learned, it shows no improvement. There is a good deal of hope in most quarters, but conditions remain the same. Reduction of wages are very numerous in industrial lines. Prices, especially for iron and steel products, are lower than ever before. Sales of wool are a little less than half, and orders for print cloths one-third of those of a year ago. R. G. Dun & Company have received replies from 1,117 houses, reporting that their sales in the last half of 1893 were 29.7 per cent. less than in the corresponding period in 1892. The failures for the week were 511, against 323 last year. Bank clearings outside of New York are 18.2 per cent. less than last year.

The electrical list outside of Western Union and General Electric experienced one of the dullest weeks in the year. The sharp decline in the securities of the General Electric company during the past year, fully noted in my last, has had the direct effect of alienating quite a large capitalistic following from electrical securities. When the property was selling at top prices it was naturally regarded as a barometer of other electrical properties. Now that it is on bed rock it is still considered a barometer. This is hardly a fair deduction for the reason that General Electric suffered owing to its method of doing business, while many of the other electrical companies are, and have been all along, conducted on a strictly conservative business basis. It will require some time to live down this adverse sentiment, and in the meantime these various securities must derive their support from those capitalists who are intimately acquainted with the nature of the respective businesses.

Western Union was utilized as a medium by the bull element, headed by Mr. Connor, to check the downward course of the market, and teach the bears one of the lessons periodically administered. In the decline from 93 to 81 a heavy short interest was created. The market opened on Tuesday with this interest at the maximum. It was so large that it became unwieldy, and in the covering movement which followed and which culminated on Friday, prices were advanced to 85⅝. There were fully 50,000 shares of the stock borrowed at the beginning of the week. The rise since that time has not been rapid enough to tempt short selling. The campaign was helped out by investment purchases which have absorbed considerable stock and also the very laudable action of certain stockholders who sought to help along the movement by calling in their loans.

The company's collateral Trust 5's were in some demand at 104 to 104⅛.

General Electric enjoyed its old time activity. From 33¾ on Tuesday it touched 30⅜ the day following, on receivership and disintergration rumors, and 34 on Thursday and closed the week strong at 34¾ to 35. In another column will be found an article of interest regarding the affairs of this company.

I am told that the company is making arrangement to press its patents suits more generally and more vigorously than ever before. Quite a number of new suits against alleged infringements have already been brought, and a considerable number of others are in preparation with the intention of filing them during the present month. There are several important patents in connection with the electric lighting as well as the motor machinery that have yet to be adjudicated. The company's debenture 5's do not reflect a feeling on the part of investors that their is any material improvement in the condition of the affairs of the company. They sold at 68 and 69. This price for a 5 per cent. security now paying its interest is certainly very low.

Edison Electric Illuminating of Brooklyn was sold at 100. The Edison Illuminating of New York sold at 97 and 98.

On the Boston Exchange Bell Telephone sold up from 184 to 186. Sales this week were *ex* the six per cent. dividend. Erie Telephone was strong from 42⅞ to 43½. General Electric preferred showed further weakness, declining to 55, which figure was bid on Friday. Considering that this stock is entitled to a cumulative dividend of 6 per cent., the price at which it is selling despite the passage of said dividend reflects very little faith of any immediate prospect of dividend resumptions. New England Telephone sold between 53 and 53½. Fort Wayne Electric was quoted at 3½ and offered at 3¾. Westinghouse assenting was bid 28 and held at 28½.

New York, January 6.

OUR BOSTON LETTER.

A New 250 horse-power engine has recently been installed in the plant of the Windsor Locks, Conn., Electric Company.

The Saranac Glove Company, at Littleton, N. H., have just added an electric light plant, new water wheels and storehouses to their extensive establishment.

The Directors of the Consolidated Street Railway Company, of Worcester, Mass., have voted to issue bonds to the amount of $500,000 to cover the floating indebtedness of the company.

The Practice of Tapping Trolley Wires for the purpose of running motors in buildings along the route of street railways has assumed considerable proportions of late, and the attention of the New England Insurance Exchange has at last been called to it, with the idea of taking some measures to prevent what is considered a dangerous use of electricity.

A Syndicate has been formed in Lewiston, Me., for the purpose of building an electric line between Portland and Boston. The scheme is one of considerable magnitude, and it is understood that the Hon. Frank Jones is one of the prime movers in the enterprise. Arthur Sewell is also said to be largely interested. The road is expected to be in operation within the next three years.

In Reply to an inquiry from a would-be investor as to what he thought of Bell Telephone stock at 190, and as to whether the present $18.00 dividends were liable to be reduced, the investment editor of the Boston *Advertiser* says: "I do not see any reason why Bell Telephone should not continue to pay its present dividends. It is true its patents run out, but it practically has and will have no competition, and its chief danger lies in State action to compel it to reduce its tolls. That is a remote probability." Perhaps some of our telephone men may be in a position to furnish some information as to what the Bell Company is likely to meet with in the line of competition?

The Men Interested in the proposed electric line between Fall River, Stone Bridge and Tiverton, Mass., held a meeting at the latter place a short time ago, at which the matter was taken up and definite plans adopted. Certain officials of the Globe Street Railway Company are behind the undertaking, and it is understood that as soon as the road is built, connections will be made with the lines of this company. Construction will be commenced early in the Spring, and the road will probably be in operation before the end of the year. Daniel T. Church, of Tiverton, was elected president, and among the directors are Weaver Osborn, Geo. W. Slade, M. G. B. Swift and Robt. S. Goff, of Fall River; Frank Stevens, of Swansea; and Nathaniel B. Church, of Tiverton.

The Matter of municipal ownership in underground conduits and subways for carrying the wires of all electric companies is receiving considerable attention, and has met with approval in many of the cities in this State. The plan is to have the city construct the conduit, large enough to carry all the wires of the various companies, and charge a rental which shall insure the city a return of at least 10 per cent. on the amount invested. This plan would, it is claimed, help greatly in preserving the streets and keeping them in good condition, as they would only have to be opened once, and the work would be done in better shape than at present. Supt. Chas. A. Morse, of the wire department of Cambridge, is an enthusiastic supporter of the plan, and claims it is perfectly feasible, and that there would be no more trouble from induction than now exists. This, however, seems to be an open question, and will no doubt be thoroughly discussed before definite action is taken. H. G. T.

Boston, January 6.

Three Paragraphs About a Contemporary.

The *Electrical World* appeared last week reduced in form and increased in thickness. There was no improvement in press work or quality of paper, and the pale green cover is retained. The ELECTRICAL REVIEW would prefer to congratulate its enterprising contemporary, but candor compels us to state that we do not believe the change to be a happy one. High class publications, such as *Harpers, Leslies, Scientific American, Western Electrician, American Machinist,* and the ELECTRICAL REVIEW, have won pronounced and recognized success in the field just deserted by the *World.* So sensitive is the public in all things that concern its reading and advertising patronage, that an abrupt change, unless a conspicuous advance, is seldom greeted with favor. The energetic proprietor of the *World* has, no doubt, made this departure in response to what he believes to be a demand on the part of the electrical public, and we shall watch with interest the result. An ably conducted journal, the *Electrical Engineer,* has achieved strength and influence along the lines where the *World* now ventures, but what to our mind is of particular importance, the *Engineer* has from its beginning been of its present size, and those who favor that form are no doubt contentedly numbered among its patrons, making it a strongly entrenched and experienced competitor.

In the first issue of our contracted contemporary are continued those features which, to our mind, should never have place in a technical journal. Further record of the litigation of the present proprietor with former editors is strongly in evidence, and the taste that permits the illustration of the bleeding halves of a man cut in two by a cable car is questionable indeed. The *World,* in its present form, gives one the instant impression that it is too contracted—as though it had been photo-engraved down, and in its advertising columns an endeavor had been made to squeeze too much text into the smaller space the reduced pages compelled. The advertisements lack individuality.

Our contemporary attempts to prove by an editorial tape line that its patronage in inches is larger than its contemporaries. We hope it is right, and that it is as well pleased with the *net returns* of the trying year just ended as is the ELECTRICAL REVIEW. While we cannot subscribe to the contention of our zealous contemporary—for we believe in living and letting live—that electrical newspaper patrons should put all their eggs in the now narrowed rim of its basket, we do most heartily wish it continued prosperity; and we take unfeigned pride in the able journalistic representation, of which the *World* is an undoubted force, that electrical science and electrical industry possess. Gazing from the pleasant and progressive heights attained by the ELECTRICAL REVIEW as the oldest, most widely quoted and influential and now the *largest* electrical weekly published in America, we enter the new year, our thirteenth, wrapping around us the comfortable cloak of public approbation, covered with joyful decorations of thousands of new readers and substantial advertisers, and say to all our contemporaries, "Bless you, little children!"

Judge Shipman Decides Against the Novak Lamp.

Judge Shipman of the U. S. Circuit Court for the district of Connecticut has filed a decision granting a preliminary injunction against the Waring Electric Company, of Hartford, manufacturers of the incandescent lamps known as the "Novak," holding that lamp an infringement of the Edison lamp patent and restraining the Waring Company from continuing the manufacture of the lamps. The owners of the Novak lamp contended that it was outside of the Edison patent, because it had in the bulb a small amount of gas, in place of the higher vacuum of the Edison lamp. Judge Shipman decides that makers of incandescent lamps cannot avoid the Edison patent by introducing gas into the bulb, and therefore the Novak lamp embodies the entire Edison invention and its manufacture is enjoined.

ELECTRIC LIGHT FLASHES.

The Fayetteville Waterworks Company, Fayetteville, N. C., will put in an electric light plant.

The plant of the Findlay, O., Electric Light and Power Company was damaged to the extent of $500 by fire last week.

Temporary electric lights on skating ponds have become quite common and are a source of additional revenue to local lighting companies.

A claim for $14,775 has been filed with the New York State Board of Claims by Winfield M. Clark, who put in the electric light plant in the new Capitol building at Albany.

The city council, of Springfield, Mo., has passed an ordinance calling a special election for January 16, 1894, to vote upon the issuance of city bonds for $300,000 for the erection of a municipal electric light plant.

Final papers for the purchase by the town of the Middleboro, Mass., Gas and Electric Company have been passed, the price being $63,000. Bonds have been issued by the town to the amount of $75,000, and municipal street lighting will go into effect at once.

The New York Board of Electrical Control has ordered that all the wires crossing Broadway from Twenty-third street south be removed, and the Fire Department has been instructed to remove its wires from the trunk line poles, on Tenth avenue between Fourteenth and Sixty-ninth streets and on Second avenue, between Houston and Forty-second streets, and on Sixty-ninth and 125th streets.

A government board has been selected to inquire into the advisability of operating electrically all appliances at the Brooklyn and Norfolk Navy Yards. The Navy Department believes that this can be done, and that it will result in an economy of money and power. The board selected will meet at the Brooklyn yard at once. It consists of Commander Washburn Maynard, Lieut. J. D. Murdoch, and Prof. O. G. Dodge.

The Rochester Gas and Electric Company, the Brush Electric Light Company and the Citizens' Light and Power Company, of Rochester, N. Y., have forces of men at work hauling cables in the underground conduits owned by the first-named company. Every week shows a decrease in the mass of overhead wires and the number or height of the poles. Superintendent Redman, of the Rochester Gas and Electric Company, says the work of hauling in the cables is being pushed as rapidly as possible.

Within a short time the Massachusetts reformatory, at Concord, will be lighted throughout by electricity, as a plant for this purpose is now being put in. The legislative appropriation for that purpose was $12,000. When completed, some 1,800 incandescent lights will be furnished, and about 40 arc lights, both inside and outside the institution. Since the burning of the gashouse last September, it has been found necessary to use kerosene oil and tallow candles for illuminating purposes. About 3,000 candles per week have been required.

The annual meeting of the stockholders of the Citizens' Electric Illuminating Company, of Brooklyn, N. Y., for the election of trustees for the ensuing year, was held last week. Thirty-one hundred and twenty-six shares of stock out of a total of 5,000 shares were voted and the present board of trustees was re elected. These trustees are as follows: Hugh McLaughlin, John Delmar, James Shevlin, Thomas F. Nevins and Anthony Barrett. The trustees will meet this week to elect officers of the company. Paul Whitehead, E. F. Peck and J. R. Barefield were elected inspectors to serve at the annual election in January, 1895.

Electric Traction in Belgium.

From and after the first of March next electric traction is to be introduced on the suburban railway between Brussels and La Petitè Espinètte.

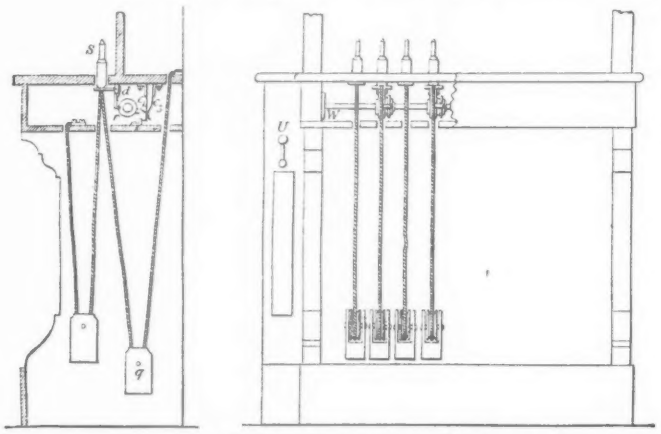
Regulations Prescribed by the German Postal and Telegraph Administration for the Construction of Electric Railways.

1. The current for the operation of the car motors to be as even as possible to prevent inductive interference with telephone lines in the neighborhood of the conductor carrying the power current.

2. Railway systems employing the overhead conductor and the track as return path for the power current are obliged to make all metallic connections between the several track sections as nearly perfect as possible. Whenever the railway power conductor crosses existing telegraph or telephone wires, the railway company must employ protecting devices to prevent any possible contact between the respective conductors.

3. If the company desires to use an underground power conductor, it should be placed at a safe distance from all existing telegraph cables. In case the distance between the power conductor and cable is less than 50 centimetres, the said power conductor must either be protected by an iron pipe or laid in a special conduit. Whenever subterranean cables, carrying power currents, cross telegraph and telephone cables, the former should be placed 40 centimetres above the latter. All protecting devices must extend two metres beyond each side of the crossing point.

4. It is not permissible to construct railway tracks over underground telegraph-



FIGS. 1 AND 2.—SHOWING DRIVING APPARATUS OF TELEPHONE CONVERSATION COUNTER.

cables. The administration demands that in streets with underground telegraph cables the railway tracks must be placed on the opposite side, or, if this is impracticable, the railway company may request the administration to change the location of their underground cables, paying, of course, for the expense incurred in such work.

5. The administration can at any time repair and relocate existing underground telegraph (telephone) cables, even though the execution of such work may interfere for some time with the operation of the railway. If possible, however, such work should be performed during night time. On the other hand, the railway company cannot enter upon any repairs of its own road bed or conductors unless the administration has been notified in writing.

6. Any extra expense, caused the postal and telegraph administration by the construction of a railway plant, will be charged to the railway company. The item "extra expense" includes all special means and devices used for the protection of existing telephone and telegraph lines, as well as for the safety of workmen employed in the service of the administration. It also includes any additional expense incurred in the protection of cables and lines against inductive disturbances caused by the power conductor. Should any dispute arise about the amount of such extra expense, the case must be submitted to the decision of the regular courts.

The Canton, O., council has resolved to ask legislative authority to issue bonds for a $80,000 electric light plant.

Catalogues and Printed Matter Wanted at Leland Stanford Junior University.

Dr. F. A. C. Perrine, professor of electrical engineering at Leland Stanford Junior University, Palo Alto, California, in a recent letter to the ELECTRICAL REVIEW, gives some interesting information about his department.

There are at present in the electrical engineering course 62 students, but it is expected that next year when the classes are in full operation there will be at least 100 students in this department. Governor Stanford's death has tied up all the university's funds in the courts, and Dr. Perrine has been compelled to rely for apparatus upon the kindness of the electrical manufacturing companies. Among those who have been very generous to the university are the General Electric Company, Interior Conduit and Insulation Company, American Electrical Works, American Circular Loom Company, Bishop Gutta Percha Company, Cuttriss Specialty Company, Leclanché Battery Company, John A. Roebling's Sons' Company and others.

Dr. Perrine requests the ELECTRICAL REVIEW to bring before its advertisers the university's need of catalogues and other printed matter. This is a request that the ELECTRICAL REVIEW feels sure will be promptly met.

By Trolley from New York to Philadelphia.

A financial paper reported last week that the plan to connect the cities of New York and Philadelphia by a trolley line has assumed definite shape. The company is entitled the New Jersey Railway Company. The line is to connect Trenton with Newark, Paterson and Jersey City, and have many branches in northern New Jersey. It is stated that Joseph H. Reall, who is well known in Philadelphia, has had all surveys made, and has acquired the right of way and secured the co operation of local lines of electric railway. The plan includes a trolley line between Philadelphia and Trenton, the two systems forming a line between Philadelphia and New York. The Jersey Improvement Company has been incorporated to build and equip the northern end of the road, and work will begin March next. Electric power plants are to be constructed at Elizabeth, Bound Brook, Trenton, Philadelphia and other points. E. Chamberlain, who was builder of the Port Reading road, is the engineer.

An Advertising Tale.

[*From the New York Sun.*]

Of the two largest clothiers in New York, the house that never advertises discharged nearly all its cutters weeks ago and has notified 30 salesmen and stock keepers that their services will not be needed after January 1. Whereas Messrs. Rogers, Peet & Company (we have it on good authority), who are constant newspaper advertisers, are keeping their cutters hard at work, and have notified their army of employés that none will be discharged—that "there are no hard times" in their live and living stores.

A New Telephone Conversation Counter.

Only a short time after the telephone had been introduced in public use, electricians and electro-mechanics, with pronounced inventive bumps, cast about for some means whereby the charges for telephonic service might be accurately ascertained.

At first the solution of the problem did not seem difficult, and a number of inventors rushed into the Patent Office, each claiming to have found the panacea, sure to cure all troubles which had developed in connection with telephone exchange service between the operating companies and their patrons. It is impossible here to mention even, *en passant*, the most meritorious or original devices. All of them accomplished registration of conversations; none of them did such registration to the satisfaction of the companies or administrations. And, indeed, besides a great fundamental error, there was a wrinkle in the problem, a bowlder on which the skiff of the average inventor was wrecked. It consisted in their failure to provide in such a system means for preventing the registration of uncompleted conversations. The fundamental error, however, was the assumption that a subscriber should pay *only* for a complete conversation; in other words, the time consumed by the telephone exchange operator in giving, or attempting to give, the desired service, did *not* enter into their calculations. But it is evident that in any reliable telephone exchange service meter, the underlying unit of measurement should be the time consumed in actual conversation on the part of the subscriber *plus* the time used by the operator preceding the actual exchange of intelligence between two subscribers, and this regardless of the establishment, or failure to establish the desired connection.

The ELECTRICAL REVIEW has promptly brought before its readers the several kinds of telephone conversation meters known, and quite recently that devised by Messrs. Siemens & Halske, of Berlin. While in the United States inventors have lately turned their attention to so-called coin-operated automatic apparatus (a popular craze, besides being one of the oldest inventions known), which apparatuses are supposed to fill measurably the demand of the public for lower rates, their European *confrères*, and especially the Austrian telephone electricians, have devoted their talents to the discovery of a counting device based on the above-mentioned and the only all-round-satisfactory principle.

Those of our readers who desire to study the principal telephone conversation counters, or methods for measuring the time consumed by subscribers in the exchange of conversation, etc., are referred to the work of Dr. Rothen (*Journal Telegraphique*, 1883, p. 193); a paper by the same author in 1888 entitled, "Etude sur la Telephonie"; several articles by Mr. Preece; the various devices invented by Messrs. Gerosa, Preiswerk, Wittenberg, Dr. Strecker, etc.; a paper by Dr. Wietlisbach (*Z. f. E.* 1893, p. 327), and a very valuable exposition of the entire problem by the engineering corps of the German postal and telegraph administration (Berlin, 1892, p. 96).

We shall now lay before our readers one of the best and, as far as we are able to judge, most satisfactory systems described in the *Zeitschrift für Elektrotechnic*, November 15, 1893, by Karl Barth von Wehrenlap, an Austrian electrician of note We believe that some such system will ultimately be adopted by all telephone exchanges of the United States. We publish herewith a full description of the apparatus devised by Von Wehrenlap:

As shown in Figs. 1 and 2 every commutating switch of a telephone central is connected with a shaft W driven by clock work U, or any other suitable motor mechanism which makes a complete revolution within 10 minutes. A number of toothed wheels *r* are fastened to the revolving shaft, corresponding in number with the number of pairs of plugs, supplied with each commutating switch. (See Fig. 3)

A metal disk *x* moving in a plane parallel with *r*, but not rotated by the shaft, bears a

notch l and a cam n (not lying in the same plane), projecting from the disk. A lever k pivoted at a by the tension of spring f, gears into the teeth of wheel a. Another lever z, pivoted at b, glides with its notched end over the circumference of disk x. Against the other horizontal end g of the lever abuts the shank of that connecting plug S, which in the connection of two lines is placed into the springjack of the called-for subscriber. On account of the pulling force exerted by the weight attached to the flexible cord of plug S (which pull is greater than that of the opposing spring d), arm h of lever z falls into notch l of disk x, which rotates together with wheel r. While resting, the right angular end of lever h strikes

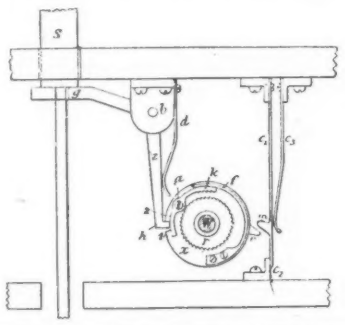


FIG. 3.—DETAILS OF DRIVING APPARATUS.

against one end, 2, of pawl k, thus throwing it out of gear with a and preventing x from turning. But by lifting up plug S from its appropriate lever g and placing it into the springjack of the called-for subscriber, lever arm h, owing to the tension of spring d, falls back, and the toothed part of pawl g is at once thrown into gear with wheel a.

Disk a now commences to rotate together with shaft U. As above mentioned, a cam n is attached to disk x, which when the former rotates strikes against m of spring c_1, lifting it momentarily from its resting contact c_2 and causing it to contact with c_3.

It will be noted that spring c_1 and contact pieces c_2 are in the circuit of each pair of plugs. In the diagrammatical drawing of a switch board (See Fig. 5), parts c_1 and c_2 are between the clearing out drop A of the called-for subscriber, and the resting contact of ringing key t_2 of the calling subscriber. The second contact springs c_3 are connected with battery t_1, which operates the conversation counters in the subscribers' stations.

As soon as line l_1 (socket T, plug s, calling key t_1, contact piece α, telephone key t_2, contact β, contact spring c_1, contact piece c_2, clearing out drop A, contact δ, telephone key T_2, contact piece γ, calling key T_1, plug S, spring f_1) and line l_4 have been connected, and contact spring c_1 (by means of cam n of disk x lifted from the contact c_2,

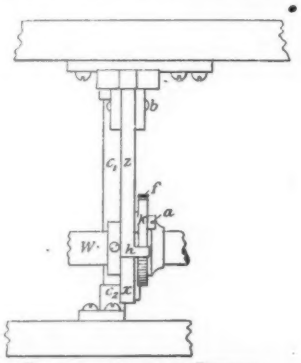


FIG. 4A.—CONTACT DEVICE.

and forced against contact spring c_3), a current impulse is sent by battery B. The path of the current is as follows, *via* c_3-c_1-β-t_2-α-t_1-s-f_1-l_1, to the calling subscriber and through his conversation counter, while at the same time the line of the called-for subscriber is disconnected. Of course, the shaft may make one complete revolution in a minute as well as in 10 minutes, or, while making a complete revolution in 10 minutes, the disk x may have 10 cams so arranged as to contact every minute with m of spring c_3.

Coming now to the process of counting, it is as follows: As soon as a call has been received at the central office, the operator places the left plug S to the subscriber's jack to find out with whom he desires to be connected. Thereupon he lifts up the right plug and puts it into the springjack of the

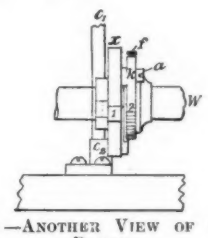


FIG. 4B.—ANOTHER VIEW OF CONTACT DEVICE.

called-for subscriber, starting at the same time the conversation counter of the calling subscriber. Should the conversation exceed the length of time stipulated for one completed revolution of the shaft, cam n again contacts with m, operating the conversation counter at the subscriber's station for the second time.

Although the above described arrangement is shown here in connection with grounded lines, it can easily be adapted to multiple boards. It will only be necessary to duplicate contact devices c_1 c_2 c_3 (see Figs. 4 and 5), and to place contact springs c_1 besides each other, so that both by cam n are lifted simultaneously from their contact piece c_2 and thrown in contact with springs c_3, the latter being also placed besides each other. Both springs c_1 and their corresponding pieces c_2 are in the metallic circuit of a pair of plugs, c_2 being connected with

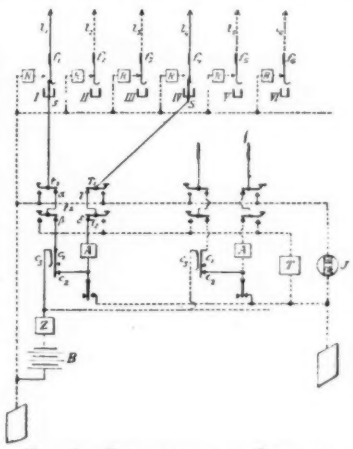


FIG. 5.—CONNECTIONS OF CONTACT DEVICES.

one terminal of the grounded battery, while its mate is earthed directly. By the simple act of lifting up the plug of the called-for subscriber, disk x is rotated by the shaft; thereupon cam n connects spring c_1 with spring c_3, and thus a current impulse passes from the grounded battery to one of the springs of c_3, the corresponding spring c_1 in the circuit of the calling subscriber, thence through his conversation counter, the return conductor, the second pair of springs c_1 and c_2 to ground. Of course, with metallic multiple switch boards one battery may serve for the conversation counters of all subscribers.

Coming now to the conversation counter at the subscribers' station, it is evident that any kind of a suitable apparatus may be used which operates with a sufficiently strong, straight current, but does *not* respond to alternating current impulses. The firm O. Schaffler, of Vienna, after a great deal of experimentation and exhaustive tests, has recently constructed a very convenient and efficient device which permits the counting of 10,000 conversations. (See Fig. 6).

The armature H of electro-magnet M carries at its free end a pivoted detent P, which is enabled to move simultaneously over two wheels N^1 and N^2, each having 100 teeth. Of course, N^1 and N^2 turn in parallel planes, and are placed close to each other, but the radius of N^1 is smaller than that of N^2, the difference being the height of one tooth. At the zero point of the dial the larger wheel has a notch of twice the depth of a single tooth, so that after each complete revolution of the larger wheel the detent p automatically falls into the teeth of the smaller wheel, moving it by the space of one tooth; in other words, the handle connected with the smaller wheel counts the hundreds, that connected with the larger wheel the units. A small cam x attached to h prevents the displacement of the two wheels. The telephone counter at the subscriber's station may be placed in the circuit of the lightning protector and the automatic switch. But for the better protection of the telephone counter against damage from stray currents, the apparatus should be inserted into the talking circuit of the automatic switch. The mode of connection and the auxiliary device constructed for this purpose are shown in Fig. 7. As shown, there is a compound lever, or a lever having two arms w and L pivoted at a. In the normal position of the compound lever, L is kept in place by the insulated end of switch

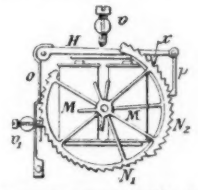


FIG. 6.—COUNTER FOR 10,000 CONVERSATIONS.

lever J, which in turn is pivoted at q, the second arm w abuts against spring f, so that the telephone counter is short-circuited, or inoperative as long as the telephone is on the hook. But, as soon as the telephone is removed, spring γ becomes operative and interrupts the contact beween w and spring f, and at the same time that between g and e, cutting the bell alarm out of circuit. In consequence of the removal of the telephone, spring γ pulls back L, so that the automatic switch J is neither obstructed in its upward nor downward motion. The turning of arm L interrupts its contact with f, disconnecting thereby the telephone counting device.

In either position of the lever arms the subscriber is enabled to use the telephone apparatus; he may call, or be called or exchange conversation; he cannot, however, stop the operation of the counter until he has given the disconnecting signal. Turning the crank g of the magneto bell after the replacement of the telephone, the eccentric rod C is also rotated, replacing thereby lever L to its former position, so that the contact between f and L is re-established, and the telephone counter short-circuited. The eccentric C is so arranged that its vertical upward position coincides or corresponds with the changes of polarity of the armature of the inductorium, whereby the retention of C in its horizontal position is prevented.

In the diagrammatical drawing of a subscriber's station (Fig. 8), ξ represents the contact lever for microphone battery D, M the microphone, Q the induction coil, Z the telephone counter. The latter to avoid its injurious effect upon voice transmission is

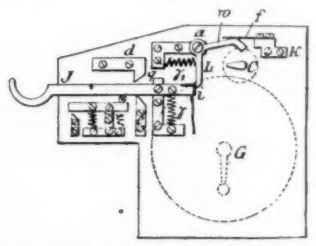


FIG. 7.—METHOD OF ATTACHING COUNTER.

bridged with a small condenser C, E is the ground or return conductor.

As shown in the drawing, the telephone counter Z is short-circuited by conductor $\alpha\gamma$L and βf. After the removal of the telephone from its automatic switch hook, the contact between L and f is interrupted. The current which operates the counting apparatus now passes from 1 over d, T, Q, γ, α; on the other hand, replacing the telephone, the current passes from 1 over e, g, I, α, through the counting device Z to ground or the return conductor.

In addition to the absolute faultless registration of conversations, the above described apparatus being quite inexpensive and of simple construction, obliges the subscriber not to leave his telephone until he has given the disconnecting signal, thus saving the time of the central exchange operator.

In conclusion, summing up the advantages of the new telephone counter, they are as follows:

1. The establishment and introduction of a time unit for conversations, and this unit being the basis for computing all charges for service, the subscribers have no longer any reason to complain of discrimination.

2. The correct registration of all conversations upon a non complicated apparatus at the subscriber's station. Thus, the subscriber at any moment can ascertain how frequently he has used his apparatus and the compensation due to the company for such service.

3. The starting of the telephone counter at the calling subscriber's station by the action of the exchange operator at the moment he makes or attempts to make the desired connection.

4. The operation of the telephone counter by a common centralized battery.

5. The insertion of a shaft turning with a given speed in the connecting and testing apparatus of the exchange operator.

6. The starting of the shaft by the lifting up of the operator's plug.

ELECTRIC RAILWAY AND POWER NOTES.

Charlottesville, Md., is to have an electric street railway.

The electric road between Wallingford and Meriden, Conn., is completed.

A contract has been made by the United Electric Company for a large plant to trans-

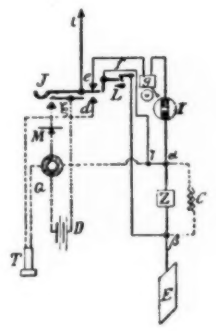


FIG. 8.—DIAGRAM OF SUBSCRIBERS' STATION.

mit its power from Indian Orchard to Springfield, Mass.

It is estimated that the West End Street Railway Company, of Boston, will require about $2,000,000 more capital to complete its electric equipment.

A system of electric roads, which will ultimately embrace nearly all the large cities and towns in northwestern Ohio, is the latest project to attract attention at Toledo, Ohio.

The Highway Commissioners of the town of Flatlands, L. I., have given a franchise to the Thirty-ninth Street, Brooklyn, Ferry and Suburban Railroad Company to operate a trolley line in the town. It will extend two miles and a half through the town and terminate in Canarsie.

The electric power station of the Interstate and Attleboro, North Attleboro and Wrentham Electric Street Railway Companies, located at Farmers, Mass., on the Wrentham branch of the consolidated railroad, was destroyed by fire, with its contents, machinery, dynamos, etc., on January 2. Loss, $75,000, partly insured.

American Electro-Therapeutic Association.

At a meeting of the Executive Council of the American Electro-Therapeutic Association, held at the office of the secretary, March 2, 1893, the following resolution was adopted:

"*Resolved*, That the secretary be instructed to prepare a circular to send to fellows of the association, to members of the medical profession, to electrical experts and to manufacturers of electrical appliances for medical work, containing titles of all the committees, the members serving on them, with their addresses, and the matter prepared for discussion and investigation by each committee.

"And that manufacturers be asked to communicate with the members of the different committees, if they desire to have their instruments examined and tested, stating their claims and merits.

"And that physicians, electrical experts and manufacturers be asked to co-operate in making suggestions and in relating their experience and preference for instruments, with reason and data.

"And to mail this circular to all members of the Association, manufacturers, medical journals and to others who are known to use electricity extensively, asking for a speedy reply either to the Secretary or to the members of the respective committee whom it concerns."

In accordance with the above resolution the following has been prepared and issued by the Secretary, Dr. Margaret A. Cleaves, 68 Madison Avenue, New York:

COMMITTEE ON STANDING COILS.

Dr. W. J. Morton, 19 East Twenty eighth street, New York; Dr. A. H. Goelet, 351 West Fifty-seventh street, New York; Dr. William F. Hutchinson, Providence, R. I.; Dr. G. J. Engelman, 3003 Locust street, St. Louis, Mo.; Mr. A. E. Kennelly, chief electrician, Edison Laboratory, Orange, N. J.

POINTS TO BE CONSIDERED.

I. Portability.
II. Practical mechanism of machines as adapted to physicians' use.
III. Range and rate of vibration.
IV. Electro-motive force and its range in relation to resistances to be overcome.
V. The resistance of the coil producing these electro-motive forces.
VI. The battery-power required for individual coils.
VII. Shape of the generated wave of electro-motive force.

COMMITTEE ON STANDARD METERS.

Dr. Margaret A. Cleaves, 68 Madison avenue, New York; Dr. Emil Heuel, 352 Willis avenue, New York; Mr. W. J. Jenks, electrical engineer, 44 Broad street, New York.

POINTS TO BE CONSIDERED.

I. A good meter should have a clear, legible scale, fairly uniform over the range, and not crowded at different points.
II. It should be capable of being noted or observed at a distance.
III. The resistance should be low.
IV. There should be no tendency to overheat with the strongest current employed.
V. It would be advantageous to avoid a shunt, if one milliampere can be read throughout the scale.
VI. The instrument should be capable of indicating in all positions.
VII. Any instrument whose indications depend directly upon the local magnetic force is objectionable, for the reason that its indications are liable to be affected by iron in the vicinity.
VIII. The suspended system should require as little attention as possible, either for adjustment or shipment.
IX. It is an advantage for the instrument to indicate with either direction of the current.
X. Portability.
XI. Liablity to fracture.

COMMITTEE ON STANDARD ELECTRO-STATIC OR INFLUENCE MACHINES.

Dr. W. J. Morton, 19 East 28th street, New York; Dr. J. H. Kellogg, Battle Creek, Mich.; Dr. Betton Massey, 212 South 15th street, Philadelphia; Dr. Margaret A. Cleaves, 68 Madison avenue, New York.

POINTS TO BE CONSIDERED.

I. Electro-static machine best adapted to medical work, to be determined by its "output." Its output to be determined as follows:
(*a*) At respectively 100 and at 150 revolutions per minute.
(*b*) With two Leyden jars, each of whose outer metallic surfaces has an area of $4\frac{1}{4}\times1\frac{1}{16}$ inches$=5\frac{5}{16}$ square inches.
(*c*) With discharging rods having ball terminals one inch in diameter and arranged respectively six inches and 10 inches apart.
(*d*) Give the number of sparks per minute which will pass between the discharging rods.
II. Give the greatest maximum length of spark with machine arranged as in Section I, except as to distance apart of the discharging rods.
III. Give the maximum length of the brush discharge between the discharging rods with machine arranged as in Section I, except that no Leyden jars are used.
IV. Give the maximum length of spark that may be obtained by a brass ball electrode, two inches in diameter, from a person's back, seated in the usual manner upon an insulated platform—the platform connected to one prime conductor of the machine, the other being connected to the ground.
(*a*) With above Leyden jars.
(*b*) Without Leyden jars.
V. Kind of electro-static machine best adapted to medical work, whether a Holtz, Wimshurst, Toepler, Voss, Carré, Lewandoski, Toepler-Holtz Wimshurst-Holtz or machine not here named, provided the type as constructed successfully fulfills requirements outlined in Section I.
VI. Does the machine preferred easily reverse its charge? Does it maintain its charge successfully?
VII. Facility and means of charging machine under all atmospheric conditions.
VIII. Can a good meter to measure the output of the machine be suggested?
IX. Mechanical construction of machine.
(*a*) Ease of actuating machine by motive power.
(*b*) Durability of the mechanism causing the revolution of its plates.
(*c*) Durability of its construction.
(*d*) Is a glass case necessary?
X. The best means for drying the air within an enclosing glass case.
XI. The best means for absorbing the ozone and nitrogen compounds formed within a glass case.
XII. Is it not advisable to decide in a general way that no machine, the diameter of whose revolving-disks is less than 26 inches, and the number of whose disks is less than six, should be recommended by this committee for medical work?
XIII. Suggestions as to a practical switch for the utilization of Morton's Static Induced and the Transformer Currents.

COMMITTEE ON CONSTANT-CURRENT GENERATORS AND CONTROLLERS.

Dr. W. J. Herdman, 48 East Huron street, Ann Arbor, Mich., current controllers and battery tests; Dr. Robert Newman, 68 West Thirty sixth street, New York, primary stationary batteries; Dr. D. S. Campbell, correspondence with physicians; R. G. Brown, E. E., Brooklyn, N. Y. Stationary batteries and dynamos.

POINTS TO BE CONSIDERED.

I. Primary batteries:
Express what preference for a certain form of battery and give reasons therefor.
Determine voltage, internal resistance, current and durability.
By what accessory appliances are currents from these batteries best controlled and applied?
II. Secondary batteries:
What are the defects and inconveniences?
What the advantage over other forms?
What the ampere hours, what the constancy, voltage and action?
III. As to dynamo currents:
What the nature of the current, what its voltages, how is it modified by the form of controller under consideration. What are its physiological effects and its therapeutical application?
IV. Report new forms of batteries and improvements, with claims as to superiority over those now in use.
V. Rheostats and controllers:
Test the various forms and devices used and recommended to modify and control currents; difference in effect produced by each, mechanically, chemically, physiologically, or therapeutically.

COMMITTEE ON STANDARD ELECTRODES.

Dr. A. Lapthorn Smith, 248 Bishop street, Montreal, Canada; Dr. Charles R. Dickson, 263 Victoria street, Toronto, Ontario; Dr. Plym S. Hayes, 84 Washington street, Chicago, Illinois.

POINTS TO BE CONSIDERED.

I. Inactive electrodes:
1. What is the best material in general for the ground work of the electrode and what in special cases?
2. How may it best be connected with its rheophore?
3. What is the best material to cover its conducting surface?
4. When necessary, how may it best be insulated?
5. In what way may it be kept warm and moist when not in use, should this be necessary?
6. What should be accepted as standard sizes and shapes, and how best designated?
7. What other points require to be considered?
II. Active electrodes:
1. What is the best material in general and in special for the ground work of the electrode?
(*a*) When used at the positive pole?
(*b*) When used at the negative pole?
2. How may it best be connected with its rheophore?
3. What is the best material to cover its conducting surface when necessary, in general and special?
4. How may it be insulated when necessary?
5. What is the best form of construction where flexibility is required for tortuous canals?
6. What shall be considered the standard shapes and sizes; what shall be adhered to in considering the latter; how may their surface area be estimated when they are of irregular shape?
7. When designated by numerals as to size and surface, how may such best be expressed when stamped or otherwise marked on them?
8. How may simplicity of construction be best obtained and cost of manufacture reduced without impairing efficiency?
9. How may facility of cleansing and rendering aseptic best be achieved?
10. What other points to be considered?
III. Active and inactive electrodes.
1. Are the terms "active" and "inactive" the best standard terms we can employ?
2. In the case of both active and inactive electrodes, should not the threads of ALL screws used in construction as a means of attachment, also all plugs and sockets, etc., be of a *standard* gauge, that electrodes might be used with attachments of all makes, etc., and to facilitate repair.

Since this circular was issued, slight changes in some instances have been made in the points to be considered by the various committees. A committee on electric light as a therapeutic and diagnostic agent was created at the annual meeting of the association in Cnicago, September 12, 13 and 14, 1893.

COMMITTEE ON ELECTRIC LIGHT AS A THERAPEUTIC AND DIAGNOSTIC AGENT.

Dr. Plym S. Hayes, 84 Washington street, Chicago; Dr. Margaret A. Cleaves, 68 Madison avenue, New York; Dr. H. H. Hahn, 304 E. Federal street, Youngstown, Ohio.

POINTS TO BE CONSIDERED—THERAPEUTICS.

I. How can the heat of the incandescent and arc light best be utilized in the treatment of disease?
II. (*a*) What form of apparatus is best adapted for the use of the electric light in the treatment of disease?
(*b*) Is there any difference in the therapeutic efforts of the incandescent and arc lights?
(*c*) Does the coloring of the light, by causing it to pass through colored glass or similar substances, add to the efficacy of the light?
(*d*) Is the light and heat derived from the electric light different or of greater therapeutic value than that derived from any other source?
(*e*) What pathogenic germs have their growth arrested, or are killed, by continuous exposure to the influence of light?
(*f*) Can a disease produced by the above mentioned germs be modified or arrested by the continuous exposure to light?

DIAGNOSIS.

I. Illumination by means of a combination of the electric light reflectors and condensers so arranged as to furnish parallel or convergent rays of light. What form of apparatus is best adapted for general use? What for special?
II. What are the best forms of apparatus for illuminating the various cavities of the body, and at the same time enabling the physician to obtain a view of the whole or part of the cavity?
Is the heat evolved from the lamp employed of sufficient intensity to require especial means for its absorption?
III. To what extent is the introduction of an electric light into the various cavities of the body, in order to determine the condition of those cavities or the translucency of the surrounding tissues, of advantage?

The Electric Mine Railroad at Bleiberg, in Carinthia.

At the lead mines of the Bleiberg Union, which cover a considerable extent of ground, the mineral from the different working places is brought to a main drawing shaft, the Rudoph shaft, 121 metres deep, connected at the surface with the central dressing floor, along the adit level in tubs containing 560 kilograms, which, when pushed by hand for a distance of 900 metres, employed a force of 21 putters, making 19 journeys in a shift, in order to supply the daily output of 224 tons, according to the *Engineering and Mining Journal*. The working of the dressing floor being in some danger of interruption from the disinclination of the putters to work regularly during the season of active operations, which is confined to the nine months, April to December, inclusive, or 234 days, it was determined to substitute mechanical for hand traction in the adit, and as there was eight horse-power available at the dressing floor, it was determined to utilize it, partly for lighting and partly for hauling purposes. For the former purpose, 30 incandescent and two arc lights have been provided, saving about £100 per annum upon the former cost for illumination; while for the second an electric railroad has been established in the adit, the whole being constructed by Messrs. Ganz & Company, of Buda-Pesth.

The railroad is different in many respects from those previously established in collieries and other mines with large and regular levels. Both shaft and adit are very wet, rendering special care necessary in the insulation, and the latter is crooked and so narrow that the dimensions of the locomotive are restricted in breadth to 700 millimetres, with a gauge of 430 millimetres, and a height of 1,700 millimetres from the top of the rails to the overhead conductors. The work, which is limited by the capacity of the winding engine of the shaft, consists in drawing 40 trains of five loaded tubs in the shift of 10 hours, with a mean speed of three metres per second (11 kilometres per hour). The tub weighs 200 kilograms, the load 560 kilograms, and the engine 1,550 kilograms, giving a total weight per train of 5,350 kilograms, which, on a level line with a traction co-efficient of one per cent., requires a mechanical effort of 161 metre-kilograms, or 2.15 horse-power, the corresponding electrical energy being 2.15 by 736, or 1,600 watts, or, allowing for resistance in the conductors and eight glow-lamps on the road, about 2,500 watts as the normal working current, which, however, is considerably exceeded at starting. The dynamo, of compound construction, is designed for a maximum of 6,000 watts at 700 revolutions per minute, giving a current of 220 amperes and 22 volts. The engine house is 95 metres from the shaft; the current is conveyed to the latter by two 6 millimetre copper wires, and thence down to the adit by a cable with two triple insulated wires covered with lead, which is laid in a water-proofed wooden case in the footway division of the shaft, so that it may be readily accessible. The line conductors are six millimetre wire, of silicon bronze, which are supported by insulators 330 millimetres apart and 1,700 millimetres above the rails. These insulators are roofed with sheet zinc and connected by pieces of galvanized wire rope to other bracket insulators fixed to the sides of the level. This arrangement gives a double insulation, which is of some importance, as the rock, from its numerous lodes and cross courses, has a not inconsiderable conductivity. In order to divert the current at points of junction, the insulated line carriers are mounted on a sliding frame, so that they can be shifted laterally from one to the other line. These points are marked by incandescent lights.

The locomotive, which is about 2.5 metres total length, has two axles, one metre apart, carries a motor with a Hefner-Altneck armature and a 46 part commutator, making the same number of revolutions, 700, as the primary dynamo, which is reduced by a screw and worm-wheel to 88 revolutions on the driving shaft, and to 34 revolutions on the front driving axle, by chain gearing, in order to obtain the required speed of three metres per second. The driving axle is coupled to the hinder one by a similar chain, the total adhesion weight of the engine being required for the full train of five vehicles. When only the front axle is driving, the load must be reduced to three. The current is taken and returned by a pair of curved tubular arms, forming spring poles, with insulated iron plates at their ends upon spring carriers, which maintain a sliding contact with the line wires. The latter have been made of silicon bronze, in preference to copper, in order to resist abrasion by the rubbing of the contact plates.

The results of the trials show the insulation to be very perfect, the loss of tension being less than was expected. The total current used, as measured at the generating dynamo, varied between eight and 16 amperes, the meter rising to 35 amperes at the moment of starting, while in smooth running it oscillates between eight and 12 amperes. The average energy required for working the line and the lighting of the road and the engine, including all losses in the conductor and magnetic friction, is $220\times10=2{,}200$ volt amperes, or three horse-power, and, as the motor does 2.15 horse-power work, the efficiency is 70%. The installation costing $6,000 does the work of 21 putters in the level, their place being now taken by 16 fillers at lower wages, the total saving being given at from £352 to £400 per annum. The advantage of lighting up the crossing points of the branch levels and the shaft bottom, which is done by pairs of 16 candle glow-lamps, is also found to be of great advantage to the miners.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Electric Light and Power.

TROY, OHIO.—The Troy Electric Light and Power Company has increased its capital from $10,000 to $50,000.

New Electric Railways.

TOLEDO, OHIO.—Articles of incorporation of the Toledo and Maumee Valley Railroad Company have been forwarded to Columbus. The company is capitalized at $300,000, and has already secured the right of way for an electric railway to Maumee and Perrysburg.

ST. JOSEPH, MICH.—The projectors of the St. Joseph & Lake Shore Railway Company, who will construct an electric railway in this city the coming Spring, say that they will build an electric line from St. Joseph to South Bend in 1894. A syndicate of South Bend capitalists will be interested with the local men in the project. The line will go through Stevensville, Baroda, New Troy and Three Oaks.

CHICAGO, ILL.—Subjacent Electric Wires Traction Company, Chicago; capital, $1,000,000. Incorporators, Charles M. Hill, Charles Rose, Thomas N. McCauley.

PARKERSBURG, W. VA.—It is announced that the American Construction Company, of Boston, has closed a contract to purchase the franchise and equipment of the Park City Street Railway, paying $55,000 cash and stock for them. The company proposes building five miles more of track and adopting electricity as a motor, expending $200,000 on the plant between now and May 1.

New Manufacturing Companies.

OLEAN, N. Y. — The Electric Land and Improvement Company; capital, $40,000. Directors, Lois Fobes, John Fobes and A. J. Schlager.

MADISON, WIS.—The Prairie City Electric Company has filed articles of incorporation in the Secretary of State's office, with a capital of $5,000. The incorporators are: W. H. Thomson, A. I. Heiman, S. N. Bisbee and four others.

TAUNTON, MASS.—Negotiations are now pending towards the establishment of an electrical manufacturing plant in one of Taunton's big machine shops.

CHICAGO, ILL.—The Todd-Applegate Company, manufacturers of telemeters, is now the National Thermograph and Electric Company.

Business Troubles.

PORTLAND, ME.—Judgment for $2,635 was entered on January 2, against the Portland Electric Light Company, of Connecticut, in favor of Morris H. Beall on a note.

NEW YORK CITY.—The Sheriff, on January 2, received an execution for $5,695 against the Goodyear Vulcanite Company, of No. 353 Broadway, in favor of William A. Brown & Company, on six notes. The company was incorporated in May, 1890, with a capital of $150,000, succeeding the Sonneborn Rubber Comb and Novelty Company; S. D Sonneborn being president and treasurer. The company formerly claimed assets of about $185,000. The factory is at Morrisville, Pa.

ATLANTA, GA.—The Consolidated Street Railway defaulted the interest on its bonds on January 2. The bondholders have agreed not to apply for a receiver if the shareholders here raise $17 per share to pay off the floating debt. The bonded indebtedness is $2,000,000.

SYRACUSE, N. Y.—W. C. Leete, dealer in electrical goods, has been closed by the sheriff.

HOMESTEAD, PA.—Executions for $16,565 have been issued against the Monongahela Electric Light and Power Company.

BROCKPORT, N. Y.—A judgment for $1,023 against the Brockport Electric Company has been obtained.

OMAHA, NEB.—Sharp & McInnerney, electrical manufacturers, have given a chattel mortgage for $325.

KEOKUK, IA.—Judge Bank, of the Superior Court, has appointed H. C. Reiner receiver of the Gate City Electric Street Railway, on the application of the Central Trust Company, of New York. The trust company holds first mortgage bonds for $85,000, on which the railway company defaulted interest. The railway is hopelessly insolvent and ceased operation some weeks ago.

CLEVELAND, O.—A deed of assignment was filed by the Ohio Construction Company on December 27. All of the property was transferred to B. M. Barr, as assignee. The company was engaged in the manufacture and sale of electrical supplies in this city. It was incorporated with a capital of $10,000. Of this amount $5,000 was issued. The assets of the company are $3,000 and the liabilities $5,500.

NANISTEE, MICH.—The Citizens' Electric Light and Power Company has been sold out.

LIVINGSTON, MONT.—The Livingston Water Power Company has given a chattel mortgage for $80,000.

CANANDAIGUA, N. Y.—The Canandaigua Electric Light and Railroad Company has given a realty mortgage for $70,000.

HARRODSBURG, KY. — The Harrodsburg Electric Light Company is talking about surrendering its franchise because of a lack of business sufficient to pay expenses. The company will suspend operations for 60 days on and after January 1.

PHŒNIX, A. T.—On application of creditors, George W. Hoadley, cashier of the National Bank of Arizona, has been appointed by the District Court to be receiver for the Phœnix Electric Light and Power Company. The company was intimately connected with the defunct Hartford Bank. Reorganization is expected to bring the company around all right, as the franchise is very valuable.

NASHVILLE, TENN.—Receivers were appointed at Cincinnati on January 5 for the United Electric Railway Company of Nashville. The Nashville Trust Company and Thomas W. Wrenne, president of the road, were placed in charge. The railway company is unable to meet its obligations, owing to the decrease in receipts. It operates 60 miles of track.

CHICAGO, ILL.—The Railway Equipment Company, with offices in the Pullman Building, made an assignment in the County Court on January 3 to George O. Fairbanks. Assets are estimated at $40,000 and liabilities at $20,000. The corporation has been in existence about four years and has done a large business in electric street railway supplies. W. R. Mason is president and C. M. Bartlett secretary.

Death of an Inventor.

We have to record the death, by pneumonia, of Anthony C. White, well known here in telephone circles, which occurred in Boston, December 27th, 1893. Mr. White was born in North Dighton, in 1858. In 1878 he entered the Boston School of Technology, where he took the course in physics, his creditable work as a student winning for him the life friendship of his instructors and fellow students. After graduating in 1882 he became associated with the New England Weston Electric Light Company, in Boston, with whom he remained till 1884, when he went to Chicago with the Western Edison Company.

While in the field of electric lighting, Mr. White was impressed with the importance of determining the conditions which influence the hissing of arc lights, and the publication of the results of his experiments in this field, in some of the foreign papers, serves to draw attention to some points of considerable interest in this phenomenon previously unobserved. It was not, however, till returning to Boston in 1886, and entering the telephone field, becoming connected with the American Bell Company, that Mr. White achieved his greatest success as an inventor. At this time long distance telephony was in a more or less experimental state, and Mr. White was among the first to realize that a more powerful transmitter was needed to place the long distance service on a practical commercial basis. In this respect Mr. White departed considerably from the accepted theories of the time, which taught that the distance to which it was possible to transmit speech was largely independent of the nature of the transmitter.

The instrument which Mr. White developed in accordance with these ideas is known as the solid back transmitter, and is practically in universal use for long distance service in this country.

In addition to his connection with the telephone business, Mr. White conducted a course at the Massachusetts Institute of Technology on the "Electric Transmission of Light and Power." He was a member of the American Institute of Electrical Engineers, of the Society of Arts, and of the Mathematical Physical Club.

He leaves a widow, and a daughter three years of age. S. B.

Boston, January 3.

The "Acme" Portable Testing Set.

Queen & Company, Philadelphia, are making a renewed push of their "Acme" portable testing set which was temporarily withdrawn from the market because of certain small defects which have now been overcome in a thoroughly satisfactory manner.

This type succeeds the "T 305" form which met with a very large sale, though it was much more bulky and heavy than the present style, besides lacking the essential feature of a battery. The "Acme" set is complete and compact, while it can be used under every possible battery condition as to electrical work or mechanical vibrations.

For testing the resistance of dynamos, motors, lamp filaments, line wire and, in fact, whenever "ohms" are to be measured, an engineer or expert will find it an apparatus that can be relied upon to work well.

After a careful test the U. S. Government has informed the makers that the set will be accepted for service on ship-board in the Navy, where the requirements are extremely exacting. In addition to this a World's Fair diploma was awarded Queen & Company for "Testing Sets and Standard Resistances," so that they feel well pleased with the deserved commendation which has been accorded to their resistance measuring apparatus.

Electrical News From Portland, Ore.

Plans have been made for the lighting plant of the new Grand Central Depot, Portland, Ore. The station is to be of 1,000 incandescent, 50 arc light capacity, situated in the annex, some 70 feet from main building, and is to be furnished with latest and best equipment. The contract for the electric work in the new city hall of Portland, Ore., which occupies one block, has been let to R. H. Tate, of that city.

The Success of Accumulators at Germantown.

We have on several occasions called attention to the progress being made in storage batteries and the growing disposition of the public to give heed to the possibilities of accumulators as a source of light and power, says *Progressive Age*. Efficiency, capacity and durability are the lines along which inventors must work in their attempt to perfect these storage cells. While the road over which investigators in this line have had to travel has been a particularly difficult one, it is amply attested by the failure of first one and then another inventor, still it cannot be said that any really meritorious invention has been brought to final success until many serious obstacles have been met and overcome.

Several systems of accumulators have, within the past few years, come before the public with loud promises of success, but imperfections in the manufacture, coupled with the knowledge that stock jobbing was associated with the enterprise, has had an unfavorable tendency, and in some degree has served to bring the storage battery into a measure of ill repute. The successful accumulator must be able to withstand rough usage and excessive discharge without serious depreciation. This applies with great force to cells used in street railway work. It must also be able to show a record of depreciation not exceeding the limit of every sort of ordinary machinery. Again, the cost of maintenance must be accurately established. We have watched with increased interest an experiment with accumulators that has been going on at the works of the Germantown, Pa., Electric Light Works. This plant enjoys, like hundreds of other central station electric plants, a good dusk to midnight business, but the day work is much smaller. Nevertheless, the boilers and engines must be run to supply the current to those patrons demanding light or power. After careful investigation the Germantown company decided about a year ago to install a small Chloride Accumulator to carry the day load of the station; the result of the experiment has proven so economical that an order has been placed with the Electric Storage Battery Company, of Philadelphia, for an installation two and one-half times greater than that which has been in use during the past 12 months. At Germantown the accumulators have been handled as follows: The battery is charged between midnight and daylight, during which time the outside load is very light. Consequently the charging can be carried on at that time to very great advantage, for the reason that the dynamos can be run with sufficient load to render them efficient; otherwise, under the very small early morning load, the machines would necessarily be very inefficient. The cost of charging the battery is barely noticeable, as the labor cost is not increased, the machinery is used to better advantage, and the increased cost of fuel is exceedingly small. At daylight the machinery is entirely shut down and the battery runs the entire three wire circuit until dusk. It is then cut out of the circuit until midnight, when it is again thrown in for charging. The day load is, in this station, as in most others, very fluctuating, since, in addition to the lights used in stores and offices, etc., there are a great many motors used for running elevators, fans, printing presses, etc.

Among the principal features of the Chloride Accumulators may be mentioned the solid construction of plates and element, together with structural strength of the active material; low internal resistance; freedom from liability to "bad sulphating," and the guaranty of the manufacturers that the cost of maintenance will not exceed 10 per cent. per annum in central station or other stationary work.

The gas companies operating electric lighting plants under circumstances similar to those mentioned of the Germantown electric plant may find in the introduction of accumulators an easy as well as economical method for the solution of a perplexing problem.

KINDRED INTERESTS

Charles D. Shain, 136 Liberty street, New York, the well-known representative of a large number of electrical houses, called on all his friends and wished them a "Happy New Year"—by postal card.

Huebel & Manger, 286–290 Graham street, Brooklyn, N. Y., makers of electrical and brass goods, have issued a very creditable catalogue, illustrating and describing their electric bells, push buttons, switches and other specialties.

The Eddy Electric Manufacturing Company, of Windsor, Conn., are increasing their working hours. The demand for their motors and generators is increasing, and very justly so, for no more capable and careful manufacturing concern is engaged in the business.

"Be Sure to Specify Kerite" is the legend on the feather of an aluminum quill penholder which W. R. Brixey, 203 Broadway, New York, is sending to his friends. It is a novel advertising idea. A circular sent with the penholder begins: "'The pen is mightier than the sword,' therefore, when the sword of competition is raised against kerite let this pen do its work."

Calendars and Holiday Souvenirs.

The Rhode Island Tool Company, Providence, R. I., have issued, as a New Year's card, a large and beautiful reproduction of a water color sketch of the yacht "Vigilant." It is very tastefully gotten up, the advertising matter is brief and not too prominent, and the picture is a very acceptable addition to any office

The James Kempster Printing Company, 117–121 Liberty street, New York, official printers to the ELECTRICAL REVIEW, send out a new edition of their very useful desk calendar. It is made in easel form or to hang up. The printing is in gilt on a black leather ground and the figures on the calendar are slanted a little to indicate the tendency of time to "fugit."

The Beacon Vacuum Pump and Electrical Company, Irvington street, Boston, send a New Year's greeting in the form of a reduced price list of the new Beacon incandescent lamps. Hereafter 16 candle-power lamps may be bought for 30 cents in lots of 1,000 or over, the highest price being 35 cents for small quantities. These lamps are made for any socket, and for voltages from 45 to 125. Prompt shipments are assured.

The New Orleans Brewing Association, New Orleans, La., issues a handsomely lithographed calendar of rather odd design. Five fairies in impossible attitudes float among the clouds and stars of heaven trailing grape vines toward the earth. They are gazing up at an American eagle perched in the hollow of a gilt crescent moon. One of the ladies is offering the eagle a glass of New Orleans beer, which he eyes askance. Considering the attire of the figures this must have been designed for a Fourth of July calendar.

The Cleverly Electrical Works, Philadelphia, have produced a series of 12 little labels like baggage pasters. There is a monthly calendar on each.

The John Polhemus Printing Company, 121 Fulton street, New York, have sent us a very legible and correctly printed calendar.

Albert B. King, printer, stationer and publisher, 87 and 89 William street, New York, has—see above.

Alfred F. Moore, 200 and 202 North Third street, Philadelphia, manufacturer of insulated wire and cables, gives away an 1894 edition of his Jumbo calendar for near-sighted people. When this calendar is hung on the front door of the Astor House, we can tell what time it is in the ELECTRICAL REVIEW office.

The Brown Electric Company, Summer and Federal streets, Boston, dealers in general electric supplies, have sent us the most novel calendar we have yet received. It is a splendid representation of a pug puppy seated on his haunches and holding a basket in his mouth. The coloring is perfect.

Recording Gauges.

The sale of Edson pressure recording and alarm gauges is steadily on the increase, notwithstanding the alleged "hard times." Mr. J. B. Edson, of 87 Liberty street, New York, the sole proprietor and manufacturer of these well-known pressure-recording gauges, reports having recently received an order for the new Postal Telegraph Building, one for the City of Mexico, Mexico, two for the public schools, one for a large malting establishment, etc. In fact this valuable instrument with its established reputation extending over a period of 20 years for doing all that is claimed for it in a thoroughly satisfactory manner, is in general use wherever steam is used, in all branches of manufacturing industry, mills of every description, electric light and power plants, pulp and paper mills, ice and refrigerating plants, breweries, hotels, buildings, public institutions, transatlantic steamships, blast furnaces, water works, sugar refineries, cotton, woolen and silk mills. The leading engineers assert that it is an essential feature in a modern and complete steam plant, and strongly advocate its employment from a monitorial and economical standpoint.

TO INVENTORS and PATENTEES.

A gentleman having a wide experience in placing Foreign Patents will return to Europe in February next and is open to negotiate the sale of a really meritorious invention in any of the countries of Europe.

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POSITION wanted by competent man who can install and operate steam and electric machinery. Will install and take charge of exhibits at the Mid-Winter Fair, San Francisco, Cal.

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The business pertaining to the organization manufacture and sales of ELECTRICAL MANUFACTURING CONCERNS a specialty. Firms incorporated under the laws of any State. Practicing in New York and New Jersey Master in Chancery.

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The Complete Electric Construction Co.,

ELECTRIC RAILROAD CONSTRUCTION A SPECIALTY.

General Offices: 121 Liberty St., New York.
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"ACME" PORTABLE TESTING SET.

The most compact and complete portable apparatus for measuring resistances.

Absolutely unaffected by magnetic fields or mechanical vibrations, and well adapted for general laboratory or shop work.

Each set is guaranteed. Write for descriptive circular No. 445.

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WATER MOTOR, $5.

Bolgiano's Little Giant WILL RUN **DYNAMOS** and other machinery.

No Plumbing Required.

Delivered Free upon receipt of price.

No. 2 MOTOR, $10 For Heavier Work.

Wonderfully adapted for running small dynamos for storing electricity in storage batteries for electric lighting.

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405 Water Street, BALTIMORE, MD.

A Suggestion That Everyone Should Heed.

Put your savings in an investment exempt from fluctuation in value and beyond the reach of commercial disaster.

There are no receiverships, reorganizations or repudiations possible in the promise to pay of the *Equitable Life Assurance Society.*

The income of the Equitable last year was $40,286,237.49. Its expense of management was less, its outstanding assurance over one hundred million, and its surplus about double that of the next largest company.

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Manager,

120 BROADWAY, NEW YORK CITY.

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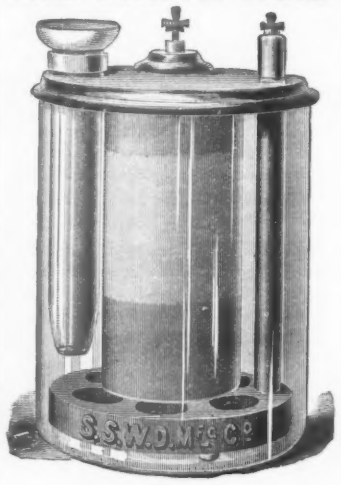
FRANK RIDLON & CO.

have taken the repair shop formerly occupied by The General Electric Co. at 180 Summer Street, and will repair or furnish duplicate parts of Electrical Apparatus. Please Telephone or Telegraph your order to

FRANK RIDLON & CO., 196 Summer St., Boston, Mass.

THE PARTZ ACID GRAVITY BATTERY



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The Highest Voltage and Most Constant Open Circuit Battery.

Use the Partz Sulpho-Chromic Salt

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